S. HRG. 99-58, PT. 7

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1986

HEARINGS

BEFORE THE

COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE

NINETY-NINTH CONGRESS

FIRST SESSION

ON

S. 674

TO AUTHORIZE APPROPRIATIONS FOR FISCAL YEAR 1986 FOR THE ARMED FORCES FOR PROCUREMENT, FOR RESEARCH, DEVELOPMENT, TEST, AND EVALUATION, FOR OPERATION AND MAINTENANCE, AND FOR WORKING CAPITAL FUNDS, TO PRESCRIBE PERSONNEL STRENGTHS FOR SUCH FISCAL YEAR FOR THE ARMED FORCES, AND FOR OTHER PURPOSES

PART 7
STRATEGIC AND THEATER NUCLEAR FORCES

FEBRUARY 21, 26; MARCH 1, 5, 6, 8, 11, 13, 15, 18, 19, 20, 1985

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DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1986

THURSDAY, FEBRUARY 21, 1985

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

STRATEGIC DEFENSE INITIATIVE

The subcommittee met in open session, pursuant to notice, at 2 p.m., in room SD-G50, Dirksen Senate Office Building, Senator John W. Warner (chairman) presiding.

Present: Senators Warner, Cohen, Quayle, Wilson, Nunn, Hart, Levin, Kennedy, and Bingaman.

Staff present: James F. McGovern, staff director and chief counsel; Christine C. Dauth, chief clerk; Robert G. Bell, Robert F. Bott, Douglas R. Graham, William E. Hoehn, Jr., George K. Johnson, Jr., professional staff members; and Karen A. Love, staff assistant.

Also present: James M. Bodner, assistant to Senator Cohen; Robert P. Savitt, assistant to Senator Cohen; Henry D. Sokolski, assistant to Senator Quayle; John L. Roddy, assistant to Senator East; Mark J. Albrecht, assistant to Senator Wilson; Mary A. Shields, assistant to Senator Stennis; Janne E. Nolan, assistant to Senator Hart; Jeffrey B. Subko, assistant to Senator Exon; Peter D. Lennon, assistant to Senator Levin; James Steinberg, assistant to Senator Kennedy; and Edward McGaffigan, Jr., assistant to Senator Bingaman.

OPENING STATEMENT BY SENATOR JOHN W. WARNER, CHAIRMAN

Senator WARNER. Today the subcommittee meets in open session to receive the testimony from administration witnesses on the President's strategic defense initiative. The Chair is informed that the ranking minority member, Senator Exon, at the moment is with the Senate leadership regarding a matter that is pending on the floor in connection with agriculture. Ordinarily we would wait, but he has indicated that he will be some time and he is prepared that we go ahead.

The subcommittee is pleased to welcome as our witnesses this afternoon Dr. Fred Ikle, Under Secretary of Defense for Policy, and Lt. Gen. James Abrahamson, the Director of the Strategic Defense Initiative organization.

The President's strategic defense initiative is being described as a research program designed to seek alternatives to our current reliance on offensive retaliation for deterrence. The SDI has been the focus of great international attention, but it has already made, in the judgment of the Chair and others, a valuable contribution to our national security by playing an important role in inducing the Soviet Union to once again return to the negotiating table for discussions relative to arms reduction.

The debate on this program, in my judgment, promises to be one of the most important in the upcoming defense authorization process. In today's session we intend to explore from the administration's perspective a broad range of policy issues that this research program offers. We will also explore how the program supports these policy objectives and in subsequent hearings we will have the opportunity to examine the program in greater detail, including classified aspects.

The subcommittee will provide a broad opportunity to hear views from outside witnesses, including views that differ from what we are about to receive on behalf of the President. These hearings will provide the basis for our subcommittee's recommendations regarding the significant funding increase request for this important initiative.

The subcommittee approaches this responsibility with intense care, for the program has many implications with respect to our basic relationships between the United States and its allies and the basic relationships between the United States and the Soviet Union.

It is the hope of the Chair that we will provide a record which is balanced, complete, and this record will be a valuable asset to Members of the Senate as they pursue their individual studying and approach the series of votes that will undoubtedly be held on this program.

Senator Thurmond has submitted a prepared statement for the hearing. Without objection, the statement will be inserted at this point in the record.

[The prepared statement of Senator Strom Thurmond follows:]

PREPARED STATEMENT BY SENATOR STROM THURMOND

Dr. Ikle and General Abrahamson: It is a pleasure to have you here today to receive your testimony on the President's strategic defense initiative. Yesterday the Senate Armed Services Committee met in executive session to review the administration report on Soviet treaty violations. The most concise way to summarize a discussion of Soviet compliance with arms control agreements is that the Soviets comply with the provisions that are in their interest to comply with, and they violate those provisions that are in their interest to violate.

Unfortunately, Soviet violations of the ABM Treaty have the potential for devastating consequences for our security. This brings us to the strategic defense initiative. With past emphasis on the structure of offensive forces in arms control talks proving to be counterproductive to our security, a change to defensive forces may offer the most stability and security.

Mr. Chairman, I would like to point out that the critics of this initiative tend to contradict themselves about strategic defense; on the one hand, they deride it as silly and unworkable, and on the other hand, they say that if did work, it would create instability in our relationship with the Soviet Union. To the first criticism, I would like to say that the Soviet drumbeat of propaganda indicates that they believe it will work, which should tell us something. To the second criticism, I would like to say that the only instability to be created in our relationship with the Soviet

Union is that they will know that a first strike on their part, or the threat of a first strike, will not achieve the desired result. Mr. Chairman, if that is an unstable relationship, then it is one we can live with.

Senator WARNER. At this time, unless other Senators indicate a desire to make opening remarks, the Chair would proceed by welcoming again Dr. Ikle for his presentation.

STATEMENT OF HON. FRED IKLE, UNDER SECRETARY OF DEFENSE FOR POLICY

Mr. IKLE. Thank you, Mr. Chairman.

The subject of this hearing is a program of extraordinary long-term importance. The research and technology effort on the strategic missile defense is to be funded at $3,722 million in the President's proposed budget for fiscal year 1986, and $4,908 million proposed authorization for 1987.

Thus, at about 1⅕ percent of the defense budget, the strategic defense initiative carries an enormous weight. It is the key for overcoming the relentless and, to us, repugnant competition in offensive arms. It at last opens the door to a long-term nuclear strategy which is consistent with the moral and political values of our democracy—to seek to defend, not to prepare for revenge.

It is our best hope for a safer future in the nuclear age. So the strategic defense initiative is not an optional program at the margin of our defense effort. It is central. The 1⅕ percent of the budget that is required for the coming fiscal year will build the very core of our long-term policy for reducing the risk of nuclear war.

By denying nuclear missile forces their military mission, strategic defense systems can facilitate significant reductions in offensive arms. By offering protection against accidental or irrational attack they provide a much better answer to this nagging, ever-present problem than the strategy of mutual vulnerability. In fact, that strategy in some ways increases the risks of accidents or irrational acts.

President Reagan has made it clear that he attaches enormous importance to his initiative on strategic defense. That is not the point, though, that I am pleading here. The time scale of this program reaches way beyond the term of this President or the next. Mr. Chairman, you know as we go about deciding on strategic weapon systems we have to think of the distant time horizon of these decisions.

From the initial research to completed development of such systems it takes 10 to 15 years, and once deployed they tend to last for 20 to 30 years. So the burden is on you, Mr. Chairman, and your colleagues in both Houses, to look ahead to the first two or three decades in the next century.

Congress as the cotrustee, together with the President, has to consider the long-term survival of our Nation. That the United States should devote at least 1 percent of its defense budget to explore and develop promising new technologies for defending against nuclear missiles is an idea with strong common sense appeal for most Americans. But a strategic theory has become influential in the last 20 years which holds that defense against strategic offensive arms is not only unachieveable but undesirable.

I believe, Mr. Chairman, that some members of maybe this committee or some other colleagues of yours in both Houses remain impressed by this theory or by parts of it, and hence tend to raise various objections against the strategic defense initiative. So I thought it might be helpful if I used the remaining minutes of my opening remarks to address a few of these objections.

OBJECTIONS AGAINST SDI

Some objections can be dispensed with rather quickly or have already been answered to everyone's satisfaction. For example, objecting to missile defenses because they would militarize outer space makes as much sense as objecting to antitank weapons for NATO because they would militarize central Europe. The militarization of outer space began in the late 1950's when the first ballistic missiles were tested.

Another argument has it that strategic defense would upset a stable order that has kept the peace for 40 years. This argument distorts history. First, the strategic relationship, as we all know, was far from stable. Second, it is plainly wrong to argue that both we and the Soviets eschewed defense.

In the 1950's we spent about two-thirds more on strategic defense than on offensive forces, and since the signing of the ABM Treaty the Soviets spent slightly more on strategic defenses than on strategic offensive forces. So much for the idea that defenses have not played a role in a stable order of the past 40 years.

Other objections to strategic defense can be grouped in three broad themes—that defenses would create new instabilities, that they would not work or not work well enough, and, third, that they would hurt the prospects for arms control. Let me make a few brief points about each of these.

It has been said that even if a fully deployed and effective strategic defense might be a good thing, the transition to it would be destabilizing. This is not the case. On the contrary, the initial phases of a missile defense on the road to a more complete deployment would enhance stability, the stability of our present deterrent forces, because as a growing fraction of the Soviet missiles could no longer reach their targets, Soviet planners would face increasing uncertainties and difficulties in designing a first strike.

Another argument about the allegedly destabilizing effect of missile defenses is equally flawed. It has been noted that certain elements of a defensive system, especially the boost phase intercept, would have to be employed very quickly in the event an enemy attack started. So some have argued that a decision "to start nuclear war" would thus have to be delegated to computers.

But by engaging these defensive systems the United States would not cause destruction anywhere. We would not hit targets on the ground anywhere. No one would be killed. Contrast this with a future without strategic defense in which our retaliatory offensive forces and our command and control could become increasingly vulnerable to a massive surprise attack, hence demanding increased reliance on quick human decisions probably based on data collected and analyzed by computers.

Is it not better to have computer assessments governing decisions to engage nondestructive defense systems than that they should govern a decision whether to "fire these atomic weapons that could destroy the human species," to use the words Walter Mondale used to describe this kind of decision last fall when he debated the very same issue with President Reagan?

Another set of objections to the strategic defense initiative has to do with the imperfection of defenses. Ballistic missile defenses could not stop cruise missiles or aircraft. In a massive attack, a few missiles could always get through, and even air and missile defenses could be circumvented by smuggling nuclear bombs into cities in other ways.

It is, of course, true that if we desired to defend against aircraft and cruise missiles we would have to add air defenses. In fact, these air defenses might utilize some of the same technologies and some of the same systems in part. Yet effective missile defenses, even without air defenses, would be of enormous value, since a confrontation of ballistic missiles is far more destabilizing than the threat of aircraft and cruise missiles.

Now as to the leakage of a few missiles, or that smuggled suitcase bomb, we have to ask ourselves what would be the purpose of such an attack. It would cause grievous destruction, to be sure, but it would not destroy our military capability. It would be an irrational attack, an act of terrorism of an unprecedented scale.

Yes, Mr. Chairman, we do need to worry about nuclear terrorism and irrational or accidental attacks in the next century. This is precisely a further reason for developing strategic defenses, because a continued exclusive reliance on a threat of revenge would offer no protection against this danger.

Some critics of the strategic defense initiative have argued that its purposes are unclear. Is it to defend our cities or to protect our deterrent forces? As we explain that by destroying attacking missiles we would help defend cities, we are blamed for undermining mutual deterrence. As we explain that by destroying attacking missiles we would also protect our deterrent, we are blamed for giving up defending cities.

But the more effective the defenses, the less an attack would accomplish in terms of military objectives, hence the more irrational such an attack would be if carried out. And the more effective the defenses, the less destruction caused by any attack, whether accidental, irrational or deliberate.

The last objection to the strategic defense initiative that I want to address briefly is that it would hurt the prospects for arms control. In the late 1960's and early 1970's it was believed that banning missile defenses would remove the Soviet incentive for building up offensive arms. This belief was the basis of the ABM Treaty. Of course, this belief turned out to be wrong. It was also thought that the Soviet Union had agreed with us on a strategic philosophy of mutual vulnerability. This, too, was wrong.

A relationship of what you might call consensual vulnerability cannot be stable. It suffers from an inherent contradiction. Relying on an imagined consensus with a partner not to defend ourselves while renewing incessantly one's capabilities to destroy that part-

ner is not a plausible and not a desirable basis for a stable long-term strategic relationship.

I believe it is far more likely that we and the Soviets in the future could someday agree to reduce offensive forces while allowing each other to have effective defenses. Such a relationship would meet the priority objective of any rational government, namely to protect its homeland.

Thank you, Mr. Chairman.

Senator WARNER. Thank you, Dr. Ikle.

I think it would be appropriate at this time if we directed some of our questions to you, and then we will hear from General Abrahamson. It sorts of breaks up the routine of the hearing. I will lead off and we will try and contain our first round to 10 minutes.

Dr. Ikle, this morning we attended a seminar sponsored by a very distinguished group of scientists. The opening comments of one were to the effect that there are 10 different definitions of this program, much of it attributed to statements by the President and others. Therefore it is the prime objective of this committee to see if we can in fact get a clear definition.

SDI OBJECTIVES

So let us start with a question which I had hoped you would treat more fully in your statement, and that is what do you see now in the initial phases of this research as the eventual areas of the United States that would be protected. Would they be population centers, would they be our strategic interests, or a combination of both?

Mr. IKLE. It would be a combination of the two in that we are seeking a capability to destroy attacking missiles, whether those missiles are aimed at our missile sites or at military targets near our cities, or whether they are part of an irrational attack aimed just at our cities.

Now one element here that has confused people is that as these missile defenses could be deployed and as they are being deployed they become increasingly more effective, initially you have a partially effective defense because it is not yet complete. You would of course have a more dramatic and significant impact in protecting our military assets than you would have in preventing an irrational attack on cities or avoiding the destruction from such an attack.

Why? Because if a calculating enemy planner—and that is the kind of planner you want to deter—can only get to 60 or to 70 percent of the targets he wants to aim at, this would enhance deterrence. If he can only hit 30 percent of the targets he wants to destroy, the military targets, he should be deterred.

On the other hand, if you look at it from our side, if only one city should be destroyed it is a terrible disaster of unprecedented proportions; two cities, unbelieveable disaster. So looking at it from that end, it seems much easier to defend missiles or to defend military assets than cities.

But, of course, what you are trying to do is to cope with a rational planner—that is what deterrence is about—and try to destroy incoming missiles regardless of what targets they have. More likely a rational planner would be primarily targeting against military

targets. But there is always a possibility of an accidental attack, an irrational attack, in which case deterrence, our present system, is of no value.

Then if you have even a partially effective defense, you at least have accomplished something. The more effective it is, of course the better off you are.

SDI COMPLETION TARGET

Senator WARNER. The reference on page 2 of your testimony to the 10 to 15 years from the initial research to be completed, and pairing that with page 7 of General Abrahamson's testimony, he seems to infer that it would be a shorter period of time. The question is to what extent is there any difference in viewpoint between the two of you on that.

Mr. IKLE. General Abrahamson may want to comment on it, but since it is my words let me put my interpretation on it. I was talking generically about strategic systems, the kind of systems you, Mr. Chairman, have to vote on. The MX, the design of which, the concept of which was forged in the early 1970's, and then the research and development was done, and we are now getting to the deployment stage.

If you go back to the time of the Atlas again, or the Polaris system, by and large these systems have a 12- to 15-year gestation period from the initial concept in somebody's mind to the finished IOC, and then they are often in place for 10, 20, sometimes for 30 years. I was not specifically referring to the systems General Abrahamson referred to.

Senator WARNER. General, when it comes time for you to testify, if you get to that part you might elaborate to make sure that we have presumably a consistent viewpoint.

Second, on page 3 your sentence, "since the signing of the ABM Treaty, the Soviets have spent slightly more on strategic defense than on strategic offensive systems," I want to make it clear that I understand that sentence. Is it not true that a substantial part of that Soviet investment has been in strategic air defense, interceptor aircraft and other systems to protect against all types of strategic intrusion, and that it does not relate solely to the SDI type systems that we are discussing today.

Mr. IKLE. Absolutely, and I am glad you made this point. I was about to make it myself.

Senator WARNER. Now my last question, and I will defer to my colleagues. To oversimplify the situation today, we had the first industrial revolution brought on by steam, the second perhaps by the mass production techniques, and now we are on the verge, if not already in, a third industrial revolution brought on by computers, microchips and the like.

And that is a very troublesome prospect for the Soviet Union, because they recognize the capabilities inherent in the west, together with our allies. Today they may acknowledge that we are ahead, or certainly in the future we could, by massing our resources, gain a very decisive edge and advantage.

TALKS AT GENEVA

Recognizing that, what part of this program, if at all, any part of the research program, is on the table, so to speak, in the forthcoming talks at Geneva?

Mr. IKLE. In the talks in Geneva, as the President has made pretty clear, we will discuss the relationship of offensive and defensive arms in addition to talking about reductions of strategic arms in START, and reduction of intermediate-range missiles in the INF talks. We will be discussing the relationship, the transition from a order such as we have now, where at least we, and to some extent the Soviet Union, rely primarily on offensive forces for deterrence, to an order where both our alliances could have defenses and thus be safer against all kinds of contingencies and more easily move to sharp reductions in offensive arms, and questions of phasing, questions of the interaction of these two approaches.

The advantages you referred to, Mr. Chairman, about computer technology are important. They play probably an important role in this area, provided we will pursue our research program that General Abrahamson will testify about, and provided also we maintain, as we have been struggling to do, control on the transfer of sensitive technology.

Senator WARNER. Senator Cohen?

Senator COHEN. Thank you very much, Mr. Chairman. I apologize for coming in late, but I think that I got the gist of what Mr. Ikle was testifying to.

Mr. Ikle, I had occasion to participate in a conference in Munich recently in which the administration made a very, I thought, forceful and rather effective presentation to our European allies. While I think we succeeded in reducing their apprehensions somewhat, I think there nonetheless remains a good deal of skepticism as to the nature of the program. Perhaps a lack of specificity is a description that comes to mind.

ALLIES QUESTION EFFECTIVENESS OF SDI

On the one hand, they raised some old fears on new wings, if I can put it that way. One question they had is if we can in fact develop an SDI program which is effective or reasonably effective against ICBMs, would it also be effective against intermediate-range systems, such as the SS-20?

Assuming the answer to that is yes, the next question could come from either the British or the French, and would say well, if in fact the SDI is effective against both intermediate-range and strategic systems, does that not render our strategic deterrent somewhat irrelevant both from the French point of view and indeed from the British point of view.

In addition, there are questions regarding cruise missiles. If you can in fact direct a strategic defense against strategic intermediate systems, does that not simply auger for the proliferation of cruise missiles or suitcase bombs that you referred to? And I did catch your comment as to what purpose would a suitcase bomb be used for. It would be irrational, without a purpose. I suggest probably the launching of an ICBM is equally irrational by any yardstick that you might care to have.

These arguments or at least questions posed by the Europeans were addressed by the administration in two principal ways. Number one, the administration suggested that we would like the European allies to share in the development of such a program, thereby deriving a commercial and strategic benefit as well. No. 2, the administration suggested that we have no real idea as to where we might come out. This is a research program only. We do not know what miracles science may produce for us, so we have to continue at that level. I would like to focus at least upon this aspect of it, as to exactly where we are going and what this admitted lack of specificity portends for the future.

How much time do I have, Mr. Chairman?

Senator WARNER. Ten minutes on the first round.

Senator COHEN. OK. Well, at the heart of the SDI, and I would like to perhaps compare, Mr. Ikle, your statements with those of General Abrahamson. In your statement you indicate "the strategic defense initiative is not an optional program at the margin of our defense effort. It is central. The 1⅕ percent of the budget it requires for the coming fiscal year will build the very core of our long-term policy for reducing the risk of nuclear war."

This contrasts somewhat, I think, with General Abrahamson's testimony, in which he seems to feel that we should proceed far enough along until we reach that deployment stage. We may reach that stage at which time we then have to decide whether to deploy or not, but deployment seems to be a given in your testimony.

I was just wondering is there a basic difference between what the General will say and what you are saying in your written statement.

Mr. IKLE. There is always uncertainty in developing any military system. There is uncertainty in the NATO alliance, often talked about for 30 years. Yet the Atlantic alliance, we all agree, is at the core of our alliance structure. So something can be at the core and yet there may be technological uncertainties as to how you get from here to there. So I do not think we have a difference here.

Senator COHEN. Well, I think the General appeared to be more tentative in terms of whether or not we in fact are prepared to make the commitment now that we are going to deploy strategic defense systems, assuming they can in fact be developed. And that really brings me to the heart of my questions, because I think at the very core, if I can use your word, of the SDI is the notion that if somehow we can erect a reasonably effective strategic defense the Soviets are going to see the futility of their offensive systems and thereby have an incentive to reduce them.

ERRANT SOVIET MISSILE

Now I would simply like to suggest that nothing in our past or present history would lend credence to the notion that this would be the result. Indeed, if I can go back just a couple of weeks to a question I posed to the Secretary of Defense—and I am not sure I got a satisfactory answer—I pointed to the question of the errant missile that was fired by the Soviets that managed to come down over Finland.

Initial reports were that the Soviets had shot it down; those reports were erroneous and the Secretary clarified that for the record. My question was assuming they had been true, assuming that the Soviets had now a lookdown/shootdown capability and could take out cruise missiles, what would have been your recommendation, General Abrahamson and Mr. Ikle, to the administration with respect to our cruise missile program?

Assuming the Soviets have the capability to shoot it down, what would you recommend?

STATEMENT OF LT. GEN. JAMES A. ABRAHAMSON, DIRECTOR, STRATEGIC DEFENSE INITIATIVE ORGANIZATION

General ABRAHAMSON. First of all, I guess I would like to go back Mr. Chairman, and address the procedure.

Senator COHEN. No, do not go back. Go back on the Chairman's time.

General ABRAHAMSON. Well, only that my instructions, sir, were that we would like to finish the questions with Dr. Ikle first, and I think that in both cases now what we have seen are areas of clarification and emphasis that perhaps we could best deal with at the same time, if that is satisfactory with you, sir.

Senator WARNER. I am anxious to allow members to have a questioning period because I am not sure about their schedules. They have made themselves available and I am anxious to afford them an opportunity to question. Do the very best you can.

General ABRAHAMSON. I will note that, then, and come back to it.

Mr. IKLE. Let me be brief, in the spirit——

Senator COHEN. Could I hear the General? I would like to know what you would recommend to the President of the United States if the Soviets had developed a capability of knocking out our cruise missiles?

General ABRAHAMSON. Of knocking out a cruise missile. It is a good fundamental question, I will have to say that.

The kind of a system that we would like for us to be able to build eventually would be one that would have human control as part of the system.

Senator COHEN. Which system are you talking about—the cruise missile?

General ABRAHAMSON. No, sir. I am talking about the strategic defense initiative.

COUNTERMEASURE TO KNOCKING OUT OUR CRUISE MISSILES

Senator COHEN. I want to find out what would you recommend if you knew your adversary had developed the capability of knocking out your cruise missiles. What would you do with respect to the cruise missile program?

General ABRAHAMSON. Oh, I am sorry. I misunderstood the question. What would I do with it?

Senator COHEN. What would be your first military recommendation?

General ABRAHAMSON. The first military recommendation obviously would be to see is there a simple countermeasure that could be used, that could be developed in order to try to counteract that

kind of a system, and that would be a very fundamental search and it probably would not stop. It would probably go on for a very long period of time.

Then it is very clear that depending on the strength and the capability of their cruise missile program, if that were a waste of resources or if it were very clear that we were not going to be able to solve that particular problem, then we would have to try to search for a better way to assure that we have military balance or security.

Senator COHEN. Would your initial response be to cancel the cruise missile program?

General ABRAHAMSON. No. It would be to first search for countermeasures, and to make sure that we do understand that now, it takes time to understand that in fact there is a profound capability to destroy a cruise missile, and as our military became convinced that a cruise missile just could not get through, that it was not an effective weapon, yes indeed, I think it would be irresponsible to come back either to my bosses or to this Congress or to anybody else and continue to ask for more cruise missiles.

Senator COHEN. So your initial response would be, see if we can develop a countermeasure or see if we can develop a better missile that could be capable of evading their defensive system. That would be a rational——

General ABRAHAMSON. That is a countermeasure, sir, a better missile.

Senator COHEN. I agree with that. I think that probably would be the rational, responsible thing to do.

The question I have——

General ABRAHAMSON. But I would not say let us go buy a large number of existing cruise missiles of exactly the same kind that I knew that they could destroy.

Senator COHEN. If you were satisfied that given the number of defensive systems that the Soviets had could be overwhelmed by proliferating the number of missiles, if they could only take out 25 or 35 percent, and that was a relatively inexpensive way of avoiding or evading their defensive measures, you would not hesitate to recommend that?

General ABRAHAMSON. It depends on the cost of those 25 or 30 percent.

Senator COHEN. I am making the assumption it would be cheaper to multiply the missiles than to deploy the strategic defensive systems that they might have.

General ABRAHAMSON. That is a very fundamental assumption, and it is not one that is a given.

Senator COHEN. I understand that, but that would be one factor that you would take into account?

General ABRAHAMSON. Yes, sir.

Senator COHEN. Does the same logic apply to our development of an SDI program?

General ABRAHAMSON. The answer is yes, sir. In fact, we outlined in our testimony last year and in many of my speeches I have tried to outline both as challenges to our own people—by "our own people" I mean the researchers who are working this problem—and as challenges to the people who are dealing with policy that

one of the things that must operate is what I call the fundamental cost inequality.

By that I mean that it must be quite clear that the technologies that we have or are developing will be such that it is in fact going to be, we are always going to be improving in terms of capability, that we would not stop at 25 or 35 percent, as you implied in that hypothetical question, and furthermore that that cost inequality is one that would not be a cost-imposing strategy of the United States but would be one on the Soviet Union.

Senator COHEN. Just one final observation and I will come back on a second round, Mr. Chairman. People like Brent Scowcroft, who were responsible for developing the commission which saved the MX for disposition this year, made a statement recently in a magazine interview in which he said, "It would be very difficult to induce the Soviets to reduce their offensive forces if they faced the prospect of a strategic defense for which they might need those offensive forces to penetrate."

So I think this is the kind of question we really have to deal with as we go along.

Thank you very much, Mr. Chairman.

Senator WARNER. Thank you, Senator Cohen.

Senator Hart?

Senator HART. Mr. Ikle, you are familiar with the speech given yesterday by Ambassador Nitze?

Mr. IKLE. Yes.

SHARING SDI VIEWS OF AMBASSADOR NITZE

Senator HART. Do you agree with that speech? Does it state your understanding of the SDI?

Mr. IKLE. I have read the speech of my friend and colleague, Ambassador Nitze. It is an excellent speech. I have also read the headlines based on it, namely that "minimum goals have been set," which I think is a bit too dramatic in the sense he was stating the obvious, which should go without saying. It applies to any weapon system.

Whether we buy antitank weapons or antiaircraft guns or antiballistic missiles SDI, the technology has to be effective; otherwise we should not get into it. And that was the point that was stressed in the newspaper.

Senator HART. Leaving the newspapers aside, I just want to know if he accurately stated your views on the subject.

Mr. IKLE. Well, I think seeing how that sentence was pulled out by the reporting, out of his speech, maybe he dramatized this a bit too much. He should have qualified, I am sure he would agree with us, by saying that any weapon system, whether it is antitank system or an antiballistic missile system, if it is not effective, you do not go ahead with it. It is an obvious and a good point.

Senator HART. Well, the reason I ask—General Abrahamson, by the way, would you agree with Ambassador Nitze's speech? Does it accurately state, as you understand it, the SDI?

General ABRAHAMSON. I think the principles that he has outlined are in fact well stated. I agree, however, that there is this potential, as in many cases of the SDI, where the newspapers have

pulled out a section of it and caused, I think, confusion by focusing only on one part as opposed to a larger meaning.

Senator HART. Many of us understand public life and how little we can protect ourselves from that.

General ABRAHAMSON. Yes, sir.

Senator HART. The reason I ask, Mr. Ikle, is that your statement here today is, at least to me, in tone so vastly different from Mr. Nitze's. For example, on page 1 you say the SDI is not optional (it is) "not an optional program at the margin of our defense effort. It is central. It will build the very core of our long-term policy."

Well, that is not what I hear Ambassador Nitze saying, and I think that is the center of the problem that many of us have with the SDI. The President came on very strong the third year into his term. I guess that is when it became central, in 1983, because it was not central to our defenses up until that time. Then he seemed to back off and suggest well, we are really talking about a research program here.

RESEARCH PROGRAM CENTRAL TO POLICY

Then your statement comes along and says in effect it is really not a research program, it is central to our defenses and at the very core of our long-term policy. And then within 24 hours Ambassador Nitze, for whom we all have great respect, says in his speech:

> The President has directed the scientific community to determine if—if—new cost-effective technologies are feasible. We envision if that research is successful a cooperative effort with the Soviet Union, hopefully leading to an agreed transition.

Well, do you understand the dilemma some of us are in? We do not quite know whether this is a research program or whether it is central to the policy of the United States and its defenses. Which is it?

Mr. IKLE. It is a research program of central importance. If, contrary to our expectations, it should prove technologically, scientifically impossible to propose effective deployments for ballistic missile defense, then you cannot do it. It would be parallel, as I mentioned earlier, if you discover it is impossible to have effective conventional improvements in NATO, we cannot do it. If it is impossible to have deterrent forces, we would have to think of something else.

Our deterrent forces are vulnerable today and will be, as Ambassador Nitze is among the first to point out, maybe more vulnerable in the future in some circumstances. Elements of our strategic defense system might be vulnerable, and General Abrahamson has spoken on that a great deal.

So these are obstacles that we have to face. If they, contrary to our expectations, turn out to be insurmountable, then indeed we could not go ahead.

Senator HART. So would it be better, in retrospect, not to say that this is central to our defenses and at the core of our long-term policy?

Mr. IKLE. Not at all. As a research program, it ought to be continued at the scale proposed by the President. It is one of the most

important or, as I put it, more properly a central research program in our defense budget. It is not a deployment program, obviously.

Senator HART. You say it is central to our defense effort. I guess we are into semantics now.

When did this become central?

Mr. IKLE. As we followed up analyzing the potential for the technology to see that the prospects for it succeeding are significant, as we analyzed, looking backwards at what has happened historically over the last 10 years with the expectations of the ABM Treaty having unraveled, as we noticed that the competition in offensive forces and the renewed discovery of vulnerabilities in our offensive forces given the Soviet effort, troubled us, we saw that it was central to look for a different path.

Senator HART. General Abrahamson, over the past 10 or 15 years—could you tell the committee how much money the United States has spent on research on all elements of the SDI—interceptors, lasers, particle beams, everything that falls under the umbrella.

General ABRAHAMSON. I do not have the entire amount of money because, frankly, it is difficult to classify exactly each of these technologies. We did go back and attempted to—we had the benefit of the Fletcher study. And, by the way, the Fletcher study was a very important element of exactly what Dr. Ikle was talking about—and that is the key technical milestone that allowed us to have sufficient confidence to say yes, this could become a central thrust of a revised type of strategic program.

Now one thing that the Fletcher study did was to go back and review existing technology, technology that had been built up over a very long period of time. And let me give you an example that shows you the difficulty of trying to answer your question directly. I am not trying to evade your question, sir.

One of the very fundamental capabilities, and it has already been mentioned, is our capability in computers, and in that kind of development. Well, does one go back and count all of the development work that went into the development of microchips or not. You see, obviously that becomes separate.

In 1984, when the Fletcher Commission examined the various technologies in the Department of Defense and the Department of Energy, they designated that there was about $940-some million, if I remember the number right, of technology effort that could directly apply to solving the problem of a strategic defense type of program. Some of that had already been started under other names, under other kinds of activities.

But that does give you, at least in that one critical year, a feeling for the scope of it, very nearly $1 billion.

Senator HART. The ABM program is really a predecessor of this, is it not?

General ABRAHAMSON. Yes, sir.

Senator HART. So if you included all the money spent on research and even deployment of a limited ABM system in the early 1970's or late 1960's, scientists estimates that we spent about $50 billion in the last 15 years on the whole range of programs, research and development, leading up to the point where we are now. Do you think that is too large an estimate?

General ABRAHAMSON. Sir, I have some of the calculations that show just exactly how accurate the Union of Concerned Scientists and Federation of American Scientists activities have been, and frankly I would not give a fig nickel for their estimate.

I will be happy to go back and research that question, sir.

Senator HART. But your point is that all money spent on ABM does not count?

General ABRAHAMSON. No, I did not say that. What I am saying is that we will go back through the records and give you as good an estimate as possible, but on the reputation of that organization and the Union of Concerned Scientists, I would not be willing to endorse any of it just right here on the spot.

Senator HART. Thank you. If you would provide those figures to the committee.

General ABRAHAMSON. Yes, sir.

[The information follows:]

Approximately $13.9 billion was spent in research and development related to ballistic missile defense between 1962 and 1983. This includes $9.3 billion for the Army's safeguard/sentinal system. Emerging technologies that encouraged the President to call for the Strategic Defense Initiative grew from numerous technical developments whose costs cannot be directly attributed to ballistic missile defense. Generic research in electronics, computers, communications, space activities, survivability and related efforts have contributed to the present store of knowledge. Because no specific program existed prior to SDI, exact figures cannot be explicity identified.

Senator HART. Thank you, Mr. Chairman.

Senator WARNER. Senator Quayle?

Senator QUAYLE. Thank you, Mr. Chairman.

RESEARCH, DEVELOPMENT, AND DEPLOYMENT

General Abrahamson, we have had a lot of research and development and we are going to keep going in this area. Can you tell us about what period of time that we will be arriving at a decision on when we can go ahead with deployment of some possible systems, the best systems that we would have available? Could you outline some sort of a time schedule for us?

If you have already done that for the committee when I was not here, I will read it in the record, but if not, I would like for you to answer it.

General ABRAHAMSON. No, sir, I have not.

Last year we testified and I continue to feel that there will be some of the technologies which will be mature enough that we can begin to make decisions on the development process, proceeding into development—which is obviously the predecessor of a deployment decision—in the early 1990's timeframe.

Now I would hasten to emphasize that very often people examine and think only in terms of the weapon and they see the various weapons that we talk about, such as the potential laser applications or perhaps rail guns or some of the exotic weapons. I think the important issue is that we have to be able to bring on line a whole family of technologies in order to put together what will be a system of systems, and it is that very broad front of technology that, No. 1, causes the requirement for a very large budget in any one timeframe such as this.

And it is also success in this broad front of technology that says one could begin to develop such a system in the early 1990's, at a reasonable risk. Obviously there is no such single point. One could make a decision earlier, but there would probably be a very high degree of risk. One could wait later and let research proceed longer and in fact——

Senator QUAYLE. But from the data that you have now, you would probably say a decision to move toward deployment would probably be in the early 1990's, and deployment would probably, if we made a decision, be somewhere in the mid 1990's. Is that fairly accurate?

General ABRAHAMSON. For some systems.

Senator QUAYLE. For some systems?

General ABRAHAMSON. Yes, sir.

HOW MORATORIUM ON ASAT RELATES TO SDI

Senator QUAYLE. Would you give us your opinion on how a moratorium on ASAT relates to SDI and the impact that any kind of a moratorium would have on research and development, a moratorium on antisatellite testing?

General ABRAHAMSON. There is a subtle relationship in that process. Some of the technologies that we are utilizing now in the SDI program are technologies that are being tested in the ASAT program. An example of that is that the ASAT uses a long-wave infrared sensor of a particular kind, and obviously we are anxious to see how that sensor operates in space against various backgrounds and picks out manmade objects, satellites in this case, against the background of space, and then begins to operate with some very subtle phenomenon that we have found out.

So there is an effect. It would cost us more. It would cost us some in additional time as one developed. On the other hand, it would not be absolutely devastating in terms of if there were a national decision that a moratorium were in the national interest, we would just have to be prepared to accept more time and find new and other research methods to begin to understand the phenomenon.

Senator QUAYLE. But it would be an impediment, from your point of view, of going ahead with the research and development if you had this?

General ABRAHAMSON. Yes, sir.

Senator QUAYLE. General, can you tell us what you are doing to encourage development of the antitactical ballistic missile defenses, particularly in working with our allies in Europe? Are we working in this area?

General ABRAHAMSON. Oh, yes. The direction that the President signed out just very shortly after his speech in 1983, and that direction is codified in my charter and it is certainly in the minds of all the researchers, and that is that we should be looking at means of countering ballistic missiles of all ranges.

Now obviously that means an intercontinental ballistic missile range that could threaten the United States, such as the SS–18 today, or maybe its successor in the future. Other types could, of course, be the SS–20, which is a very important threat to Europe but not to the United States at this point. And then looking down

to a very difficult task of reaching the tactical systems, such as the SS–21 and SS–23, which are very short-range, theater range, nuclear weapons.

ANTITACTICAL BALLISTIC MISSILE SYSTEM IN EUROPE

Senator QUAYLE. Is it your opinion that we could deploy an antitactical ballistic system in Europe and not violate the ABM Treaty? Maybe I better ask Mr. Ikle. For antitactical ballistic missile defense in Europe, is there any question about that violating the ABM Treaty?

Mr. IKLE. Probably not, because the ABM Treaty is against strategic missiles, which are defined as intercontinental.

Senator QUAYLE. So we could go ahead and deploy in Europe, say, without any repercussions?

Mr. IKLE. Well, you could keep lawyers busy on that question for 20 years.

Senator QUAYLE. Well, what is the thinking of DOD? What do your lawyers tell you?

ABM TREATY AGAINST BALLISTIC MISSILES

Mr. IKLE. As I said, the ABM Treaty is against strategic missiles, defined as intercontinental range, over 5,500 kilometers, and therefore would not apply by that reasoning to shorter-range missile defenses.

Senator QUAYLE. OK. What effect would the deployment of such a system in Europe have on any INF reductions, an antitactical ballistic missile defense? If you look at INF and you are talking about reducing, we start out with the zero-zero option, and went ahead and deployed, and we are still negotiating right now.

What kind of an impact do you think the deployment of an antitactical ballistic missile defense system would have on INF talks?

Mr. IKLE. Here we are, of course, speculating about Soviet motives, but it has been pointed out that an effective ballistic missile defense makes ballistic missiles less interesting, hence should increase the willingness to abandon those missile forces that can no longer penetrate in the process of arms reduction negotiations.

So I would think if there can be effective theater missile defenses and this becomes clear and apparent to the Soviet Union that there is a willingness to deploy those, this could be an incentive for giving up their systems, which are no longer effective.

Senator QUAYLE. So if that is the response and if that is the thinking of the Soviets, then it would be a positive contribution to INF reduction on both sides?

Mr. IKLE. Well, it would be also positive from the point of view of military security. One thing we are concerned about, as Secretary Weinberger pointed out in December, is that with the greater accuracies coming in about 10 years the Soviets could use their theater missiles, SS–20 and shorter-range ones, for launching a conventionally armed attack against NATO military targets in a surprise strike without going over the nuclear threshold.

And there is no answer to that but ballistic missile defenses.

Senator QUAYLE. That is on a conventional attack?

Mr. IKLE. Right, with ballistic missiles.

Senator QUAYLE. OK.

Mr. IKLE. So in that sense that would be a military problem which would be at least partially solved by such a defense.

STRATEGIC DEPLOYMENT

Senator QUAYLE. Now shifting back to the strategic deployment, if we continue on SDI, which I am certain the Congress will go along with, at some point down the road we are going to run smack into this ABM Treaty as it stands right now. Is that not correct? At some point, we are going to either have to say that the treaty, that the Soviets are not complying with it, the basic principles at the beginning are not being adhered to and, therefore, from a contract point of view you can say that the treaty is not any good or not valid.

Another option would be to renegotiate, but I suppose just to renegotiate an ABM Treaty by itself may be a little bit difficult.

I wonder as you look at this and looking at the ABM Treaty, why is it that we continue to comply with it when the Soviets do not?

Mr. IKLE. We are more law abiding, Senator. We are concerned. Your question, of course, leads to the answer we are concerned about a double standard, where we abide by all the provisions of the ABM Treaty and other treaties, and the Soviets do not. And that leads right up to the question of noncompliance and what it is that we can do about it.

Senator QUAYLE. What can we do about it?

Mr. IKLE. Well, we have to, in addition to the political pressure and arguing with the Soviet Government on returning to full compliance, we have to keep monitoring their noncompliance and evaluate its military implications and at some point we have to decide whether we can still abide by these treaties or whether it is in our interest to tell the Soviet Union that since they have been violated we cannot.

Senator QUAYLE. Thank you, Mr. Chairman.

Senator WARNER. Thank you very much. Senator Nunn?

Senator NUNN. Mr. Chairman, some of our colleagues came in first, and I will defer to them.

Senator WARNER. I think Mr. Bingaman has been here for some time. As usual, he starts every hearing on time.

Senator BINGAMAN. Thank you, Mr. Chairman.

PURPOSE OF SDI

Let me just ask a few questions. One, Mr. Ikle, which has concerned me and which several people have raised, is the purpose of SDI. It seems to me that either we should have as our purpose to increase deterrence—and I think you refer to that in your testimony as a result—or we should have as our purpose to replace the whole deterrence concept and build an alternative to this MAD strategy that has been pursued for years.

It seems as though the description of it has it doing both. Which do you believe SDI is intended to do?

Mr. IKLE. Well, deterrence is a multicolored word, much used and abused. We want to dissuade, of course, the Soviets from attacking to begin with, and in the last 20 years we have thought of

doing that simply by being able to have an act of revenge, of retaliation, and not to seek to defend ourselves against nuclear attack. In contrast, of course, in the conventional area, we very much want to deter by being able to also defend ourselves.

The concept of the strategic defense initiative is to dissuade the Soviet Union, as this concept can unfold itself and materialize in decades down the road, dissuade the Soviet Union from attacking by making it impossible for them to achieve a rational purpose of their attack. That would be the defense.

Now as we get from here to there we will still have to rely also on the threat of retaliation and particularly on the initial partial capabilities of a defensive system as it gets deployed; that system would protect some of these military retaliatory capabilities and thus be helping our traditional deterrence.

ABILITY TO RETALIATE

Senator BINGAMAN. But you see our ability to retaliate or the threat of retaliation as something that we would be willing to give up at a stage down the road in the SDI program; is that accurate?

Mr. IKLE. Yes, it would be diminishing and eventually, if we can fulfill the vision articulated by the President of abolishing nuclear offensive forces, we would get rid of that.

Senator BINGAMAN. But your concept is that we build SDI, then the Soviets eliminate their offensive forces because they recognize the futility of having them, and then we eliminate our offensive forces; is that accurate?

Mr. IKLE. There are essentially two roads. The preferred road is that we can both agree together to reduce the offensive forces and thus make it easier and cheaper, of course, to have effective defenses for both alliances.

But this gets back to a question that Senator Cohen asked of General Abrahamson, it is possible that the Soviets will first try to resist this concept and try to overcome our defenses, redouble their efforts in a missile buildup to overcome our defenses, and then, of course, the effectiveness of our defense becomes very important, and General Abrahamson referred to it.

Now incidentally, and we are harkening back to Senator Cohen's question, the Soviet Union has given up on their intercontinental bomber program because they felt our bomber defenses around 1960 were very effective. There are several references to it in Kruschev's memoirs, and they shifted, of course, to ballistic missiles.

It is conceivable that they may shift to bombers and cruise missiles to begin with if they find our SDI is effective.

Senator BINGAMAN. But you would not see them giving up the offensive capability. You are just saying that they would shift?

Mr. IKLE. Depending on the agreements you can reach, we can reach the President's goal of reducing and abolishing offensive forces that would include bombers and cruise missiles as well.

Senator BINGAMAN. You had a reference here that since the signing of the ABM Treaty the Soviets spent slightly more on strategic defenses than on strategic offensive forces. I assume that in that statement you are including in strategic defenses civil defense.

Mr. IKLE. No, no. Active defenses.

Senator BINGAMAN. Not civil defense.

Mr. IKLE. The air defenses, as the chairman pointed out, but not civil defense.

REDUCED FUNDING ASKED FOR CIVIL DEFENSE

Senator BINGAMAN. This year the administration has asked for a very substantial cut in funding of civil defense. Is that because of a determination that SDI will replace the need for civil defense? Are we abandoning civil defense as a national policy?

Mr. IKLE. No. This is a different time phase we are talking about here and we will be testifying separately, Senator, on the rationale and budget of civil defense. But, in a way to scoop future testimony that you will receive here, it is a rethinking of the purposes of civil defense in this intermediate period.

Senator BINGAMAN. But you are going to testify to us about the rethinking?

Mr. IKLE. There will be separate testimony coming.

Senator BINGAMAN. I see. OK.

Are you familiar with any other research program. Here you are asking for 150 percent increase or growth in the SDI this year, and this is a research program that is at its very early stages, as I understand it. Do you know of any other defense programs that have seen this kind of an increase in growth in 1 year?

APOLLO PROGRAM

General ABRAHAMSON. I think there have been serveral programs like that. Could we put the Apollo Program profile up, please?

An important difference in this research program and in programs that you are often faced with examining is when you are in the beginning of a development program itself in many cases the development program is with one central prime contractor or perhaps two or three contractors, and they have a series of subcontractors, and you are trying to develop and then expand a production line.

This is not that at all. This is a kind of program where we in fact have hundreds of small line items of efforts themselves, and later on I will try to begin to give you a feel for what these differences are. In each one of these areas what happens is that we are trying to bring forward in some cases from just a planning number, in other cases where you have done some early research in hardware into something rather dramatic in terms of producing experimental hardware for test.

Now the Apollo Program, and in order to make sure that is accurate at this point in time, I would like to point out what I consider to be an error in the chart, and that is prior to that 1963 timeframe, even though the formal Apollo Program started there, there was money that was being spent in baseline kind of research and baseline endeavors that added up to on the order of $2.5 billion.

So those were in a sense like the $1 billion that I mentioned in 1984 that was primary and before the research that we now started as a defined SDI effort. When a goal like this is set, and particularly where you are examining parallel approaches because you do

not know which of these might work, there are precedents and there are others as well.

COUNTERMEASURES TO DEFEAT SOVIET SYSTEMS

Senator BINGAMAN. Let me ask one other question. I gather Secretary Weinberger, when he testified to us earlier, talked about countermeasures to defeat Soviet systems and research going forward in that capacity. Is there not something inconsistent about us suggesting the sharing of this technology and also developing countermeasures to anything they might have?

Mr. IKLE. The sharing we have been talking about is, of course, with our allies, with proper safeguards against———

Senator BINGAMAN. No; I am talking about the sharing with the Soviets.

Mr. IKLE. The sharing that the President referred to on SDI, as he put it quite clearly in October again in a debate with Walter Mondale, is when the Soviets have agreed to abolish offensive systems and we have gotten rid of these offensive systems, then we can work together and by that time there will be a small effort needed to have residual defensive forces against breakout-cheating, third countries, terrorist, what have you.

Senator BINGAMAN. So until there was agreement to totally abolish offensive systems you would not anticipate any sharing?

Mr. IKLE. It is unlikely. You would want to negotiate the phasing, the phasing out of offensive systems, and at the end work together to have a stable continuing program way in the next century of residual defenses.

Senator BINGAMAN. That is all I had, Mr. Chairman.

Senator WARNER. Senator Wilson?

Senator WILSON. Thank you very much, Mr. Chairman.

Mr. Chairman, I would like to take just a minute of my 10 to follow up on a point that General Abrahamson was making in response to questions from Senator Bingaman and Senator Hart. I am going to ask Mr. Albrecht to hold up a chart. I apologize for the crudeness of the graphics. It is not of the same quality that we have just seen. However, I think it may make the point.

MISSILE GROWTH RATE CHARTS

Instead of making a comparison with the Apollo Program, this makes a comparison of the growth rate in the research and development spending for the Thor and Atlas Programs as compared with SDI. The SDI Program is the blue, Thor is the green. The red is the Atlas.

It shows the increase in percentage over the 4-year period, actually 3 years in the case of Thor, 4 in the case of Atlas and SDI. What it shows is that the rate of growth, measured as a percentage, has been less for SDI than it was for Thor, rather notably, and slightly more than for the Atlas missile. It seems to me that what we are seeing here is an effort to expend equivalent effort and dollars on a defensive capability equivalent to that that was spent to achieve these two missiles.

We have the actual numbers so that I think the percentages will be borne out. If you are interested in the numbers, we can provide those.

Mr. Ikle, let me ask you a couple of questions. First, is it not true that there was a difference in the directives given to the two panels commissioned to implement the strategic defense initiative. The first of those panels that dealing with technological feasibility is known as the Fletcher Panel. The second, dealing with policy, was known as the Hoffman Panel.

As I understand it, the directive given by the Department of Defense to the Fletcher Panel was one that asked them to contemplate more or less a complete system after the year 2000, whereas a different directive, if I am correct, was given to the Hoffman Panel, which allowed them to come up with recommendations supporting near-term deployments of a more limited system of defense. Is that true?

Mr. IKLE. As I recall it, the effort was made to have the Fletcher Panel focus really on the more distant point, to get away from systems that could easily be overcome, to see whether this competition again that Senator Cohen referred to earlier can be discouraged, or the Soviets, by the potential of an effective, hard-to-overcome system, can be dissuaded from constantly trying to negate defenses with countermeasures.

So you are right. The Fletcher Panel was directed in that effort to look at the more distant systems so that we have an answer on that and can work backward.

The Hoffman Panel, being in charge of the political strategic implications, had to look at the transition period and made quite an effort on that, as you know.

Senator WILSON. Mr. Chairman, I think it is a fair statement that the directive, the limitation on the effort to be made that was given in the charge to the Fletcher Panel effectively precluded them from really considering the consistency of their own work with that of the Hoffman Panel, which in fact did support as feasible near-term deployments.

And in fact last year during the debate I had the occasion to call Dr. Fletcher and ask him whether he thought there was utility to something less than a perfect, leak-proof defense in the nearer term. He said without question, unequivocally, the value is very clear. He said the value is that in the short term, used to protect our retaliatory counterforce, we would make so unprofitable a first strike against that retaliatory force that any rational Soviet war planner would, of course, not entertain that thought because he would assure himself of retaliation.

HOE TECHNOLOGY

Let me ask, Secretary Ikle, with respect to this so-called terminal defense, initially the discussions of the validity of terminal defense have had to do with assumptions about the range of a weapon that would be something in the neighborhood of 80,000 kilometers.

Now is that not technology that is about 15 years old, really based on the limitations of a radar capability that existed at that time, and is it not true that to think of it in more relevant and

more modern terms we have to consider that the successful intercept by the homing overlay experiment was at a range of 200 kilometers?

Mr. IKLE. This greater range could indeed be part of the effectiveness of the early phases of deployment, and General Abrahamson I think should answer that in more detail. Let me just quickly pick up the policy aspects of your question.

As we travel the road toward an effective defense that protects our alliance, we should pick up as a bonus effect the initial benefits of disabling the enemy planners, as I pointed out earlier, from planning an attack against our missiles and our military targets, and that is really what you are talking about in the transitional deployment.

There is no contradiction between defending cities and defending missiles. And it is good to move, once we can establish we can get to where we want to go, to move quickly and pick up these advantages of the interim capabilities.

Senator WILSON. My point is that I am told I said 80,000 kilometers. I meant 80,000 feet. The real point of the question is that with the capability that was demonstrated by the HOE to intercept at a range of 200 kilometers, we have a situation in which we are now talking about a vastly different capability. Whereas, because of the limitations that existed some 15 years or so ago, we were talking about a relatively small cone of a defensive area.

Then we spoke of point defense, as I understand it, at a range of 200 kilometers, you now have the ability to defend an area equivalent to about half of the continental United States, is that true?

General ABRAHAMSON. Sir, I agree. I would like to perhaps clarify the way I consider the HOE technology and what it was that really was demonstrated. The HOE technology and the significance of that particular intercept, the first and foremost significance was that we were able to intercept head-on-head, meaning on a warhead coming in at full intercontinental ballistic missile speed, with another nonnuclear warhead that just destroyed by hitting that particular system.

We were able to intercept that, and that was the real proof. And what we demonstrated then was the idea that you could use a surveillance system that could move as quickly as one needed and intercept it.

Now it just happened that we had that sitting on a rocket which was able to get out on the order of several hundred kilometers high and several hundred kilometers down range from that particular target, but, by the way, by basing that in different kinds of configurations that could be used as a midcourse intercepter. It could be used as a very large terminal area intercept. It can be used really quite flexibly.

And I believe that I am enchancing the point that you are making, that indeed that technology, which is not some of the more advanced things that we often talk about when we talk about lasers, we have already proven feasibility and it can be applied in a fairly broad way. In fact, many elements of that same technology could be based on space and with some improvements it could be used even as a boost-phase interceptor.

Senator WILSON. Well, I think that does lend considerable credence to the statement which Secretary Ikle has made in his statement, upon which I congratulate you, that the more effective the defenses, the less an attack would accomplish in terms of military objectives, hence the more irrational such an attack would be if carried out.

I also quite agree that there is a danger that there could be accidental or utterly irrational attack and irrational attack even with an ICBM. I think of Colonel Qadhafi, who does have submarines.

It seems to me there is a need for that kind of defensive capability and I am advised that terminal defense of a retaliatory force, given the change in the altitude at which nonnuclear interceptors could engage an incoming missile, also has the virtue that it can give some preferential defensive targeting ability to protect cities against what might be accidental or irrational attack of a kind which I quite agree would be irrational, because it would not in any way accomplish a military objective.

It seems to me, Mr. Chairman, that that is the real point of discussions about terminal defense in a transitional time, and that is even if you assume that your opponent is ultimately evil I think you have to assume him rational. If they are rational, then there is very little percentage in their engaging either in an attack in a first strike against our retaliatory force, even less against our cities, knowing that the sure consequence of that would be the very kind of retaliation that they clearly wish to avoid.

My time is up, but I would conclude with this comment. Mr. Chairman, I think that we are inevitably engaged, as we have been since the history of weaponry began, with a need to anticipate ongoing countermeasures being developed. Indeed, Mr. Perle's testimony to us yesterday, which if classified was no constraint upon the Washington Post in their story on it this morning, indicates that there is considerable evidence that the Soviets are moving toward a capability to break out of the ABM Treaty.

I will simply say that it would be derelict in the extreme if the United States did not pursue the strategic defense initiative, anticipating that the Soviets have been and will continue to do exactly what it is they are seeking to discourage us from doing at the moment.

Senator WARNER. The Chair looked into the question of the article this morning and it is my understanding that the quotations have been either been made previously or were of an unclassified nature, although the hearing yesterday with Mr. Perle was classified and we did not have, because of the joint session, the opportunity to go into an unclassified session, nevertheless the quotes were unclassified.

Mr. IKLE. The testimony was unclassified.

Senator WARNER. Now, Mr. Nunn, we have three of your colleagues remaining, and if you would manage the time, then we will proceed to General Abrahamson.

Senator NUNN. Well, I think, as I recall, Senator Levin was here before I got here. You go ahead. I think I managed to edge out Senator Kennedy by a nose.

Senator LEVIN. Nobody will edge me out by a nose, I tell you. [Laughter.]

ANTIBALLISTIC MISSILE TREATY OF 1972

Thank you, Sam. Mr. Ikle, let me ask you about the following comment of the Scowcroft Commission in March of last year, less than a year ago. They wrote that: "One of the most successful arms control agreements is the Anti-Ballistic Missile Treaty of 1972." Would you agree with that?

Mr. IKLE. In terms of its impact, it was very important. In terms of its benefits, it has not met our expectations. It has been disappointing.

Senator LEVIN. Would you phrase it that way, then, the way they did?

Mr. IKLE. I would not, therefore, phrase it the way they did.

Senator LEVIN. Is it the administration's position that we are ruling out the possibility of giving up strategic defense either in the research stage or, if it becomes feasible, in the deployable stage? Is that our position?

Mr. IKLE. In the research stage we would see no way of making such a stoppage, such a ban, verifiable. For that very reason, the ABM Treaty, even with the philosophy at that time, did not prohibit this kind of research.

And if the research stage indicates that the program could meet its intended purpose, as the President indicated, this is the direction in which we should go and we want to negotiate with the Soviet Union how we can walk in this direction together.

Senator LEVIN. So we have not ruled out the possibility of giving up strategic defense if it becomes feasible in the deployable stage?

Mr. IKLE. Well, I put it the other way. We have, as the President indicated, considered the right way to go is to reduce offensive systems and permit, as I say, not ban defenses, and this is our opinion now. So with this opinion in mind we are not contemplating abandoning defenses.

Senator LEVIN. Well, the question is, I thought that the President's position is that if research shows that it is feasible, then we will decide whether or not to negotiate limits on it.

Mr. IKLE. When we see that it is feasible and what the nature of the system is, and what its cost and time scale is, then is the time for a decision on deployment. That, of course, would be in a future administration. Given the philosophy that the President articulated about ballistic missile defense, one would want to go forward with such deployment if it is shown to be feasible. One would not want to negotiate that deployment away.

RULING OUT NEGOTIATING LIMITS ON STRATEGIC DEFENSE

Senator LEVIN. My question is have we now ruled out negotiating limits on strategic defense. That is my question.

Mr. IKLE. It is not our intention to negotiate limitations on strategic defense.

Senator LEVIN. At any point?

Mr. IKLE. Because we are engaged in a research program which could not be limited in any event.

Senator LEVIN. No, you are not answering my question. The question is, if it proves to be feasible, have we decided that we will not negotiate limits on it?

Mr. IKLE. That will be several years hence, and the way in which this President and this Secretary of Defense and Secretary of State look at defenses, we would not want to then negotiate away defenses.

Senator LEVIN. Have we ruled it out? My words are clear. Have we now ruled it out?

Mr. IKLE. The President can not now rule out such decisions for his successor twice removed. It is not legally possible.

Senator LEVIN. The Secretary of Defense says that we have ruled it out.

Mr. IKLE. Well, in his view and in the President's view and in my view indeed, yes.

Senator LEVIN. You cannot rule it out, but you have ruled it out?

Mr. IKLE. We would rule it out, right. It is not our recommendation to have limits on defense imposed by our successors.

ABOLITION OF OFFENSIVE WEAPONS

Senator LEVIN. As I understand your answer to Senator Bingaman's questions, you ultimately want to get to the abolition of offensive weapons, to make them obsolete. But there will be some intermediate stage where there might have to be a combination of defensive and offensive weapons. Is that fair?

Mr. IKLE. Right.

Senator LEVIN. Would you agree that the combination of defense against space missiles with retaliatory offense in reserve enhances deterrence?

Mr. IKLE. Yes; as I mentioned in my opening remarks, a defense which would at that early stage probably be a partially effective defense combined with our traditional retailatory systems would be more stable than what we have now because it would be more difficult for the Soviets to calculate the effect of their attack.

Senator LEVIN. So you would agree it enhances deterrence?

Mr. IKLE. Right.

Senator LEVIN. Would you agree that defensive weapons, if paired with offensive systems, can be viewed as fostering an aggressive policy?

Mr. IKLE. It can, if the offensive weapons are particularly effective for counterforce strikes or for attacking outer areas of an alliance, such as the Soviet SS–20, or their other missiles against our NATO allies defenses could at some stage, if the Government is pursuing aggressive policies support such aggressive policies.

Senator LEVIN. So that the combination could be viewed either way, depending on the type of offensive weapons that one has?

Mr. IKLE. And the general orientation and purpose of your forces.

Senator LEVIN. And how they are viewed by the others.

Mr. IKLE. The primary effect would be to stabilize the deterrence effect of the intercontinental forces.

Senator LEVIN. But if you have highly accurate first strike weapons, it could be viewed as an aggressive combination, viewed that way?

Mr. IKLE. I think we make this clear if we get away from the abstract situation. Let us say the Soviet Union had rather effective ballistic missile defenses and we had none, and they are continuing

on their program of counterforce capabilities and highly accurate SS-20's and so on. In some crisis, a conventional war in NATO, this kind of combination could give them a backup which would be very hard to counter for our alliance.

NEGOTIATIONS AT GENEVA

Senator LEVIN. We are not going to negotiate any limits on research. We are not going to negotiate any limits on deployment. What is it that we are doing at Geneva at the space and defensive weapons portion, or component? What are we negotiating there? What have we agreed to talk about if we have already decided we are not going to negotiate anything to do with either research or deployment of space weapons?

Mr. IKLE. We could indeed negotiate and talk about deployment, but not giving it up. Often negotiations deal with something without just dealing with giving up that item. We negotiate about hotlines. We negotiate about confidence-building measures, maneuvers. That does not mean we negotiate about giving up maneuvers. We negotiate about informing each other about maneuvers and coordinating them.

Likewise, here we can negotiate about coordinating the deployment, the phasing in of defensive systems and how that relates to the phasing down of offensive systems.

Senator LEVIN. To put it in a nutshell so that folks can understand it, research into space defense and deployment of space defense are not on the negotiating table in Geneva?

Mr. IKLE. They are not things to be given up.

Senator LEVIN. Are they on the negotiating table?

Mr. IKLE. They are things to be discussed as to the phasing, as to maintaining stability, about coordinating with each other so that there is no disturbance in our present relationship that would be destabilizing.

Senator LEVIN. They are to be discussed but not negotiated?

Mr. IKLE. They are to be negotiated like the parallel I gave you, the analogy when we talk about confidence-building measures regarding maneuvers. We do not give up maneuvers. We negotiate to inform each other about our maneuvers.

Senator LEVIN. Is there any intention to avoid the use of the word "negotiate" relative to space defense? I hear the word "discuss." I always ask the question are we going to negotiate, are they subject to negotiations, and the answer I always get back is we are going to discuss it.

Do you draw a distinction between discussing them and negotiating them?

Mr. IKLE. I think one could make that distinction. We referred to the hotline negotiations, though in some sense these were discussions about how to coordinate on a hotline, and in that sense, Senator, you might want to call it discussion.

Senator LEVIN. Do you make that distinction?

Mr. IKLE. I would not belabor it.

Senator LEVIN. Then I will not either, since my time is up.

Senator WARNER. Senator Nunn?

Senator NUNN. Thank you, Mr. Chairman.

MUTUAL ASSURED DESTRUCTION

Dr. Ikle, a couple of questions just on concept. How do you define the concept known as mutual assured destruction?

Mr. IKLE. It is generally used as a relationship where both we and the Soviet Union rely on retaliatory offensive forces that can assure mass destruction of the opponent after an attack and avoid or essentially avoid defenses. Some people go one step further and use that same word to mean that the response, retaliatory response, would be against cities, and often it is used in that second meaning.

But that, of course, has not been our policy, as you well know, Senator.

Senator NUNN. Well, I was going to ask that next. But mutual assured destruction could mean, in other words, depending on how you define it, broadly or narrowly, it could mean on a narrow definition simply a destruction of cities or going after population. A broader definition could include going after military targets—basically the ability to survive and retaliate and cause enough destruction to deter. Is that a fair assessment?

Mr. IKLE. Correct.

Senator NUNN. Which definition do you use?

Mr. IKLE. I think usually the more narrow definition, because that seems to be the way it is understood by the general public, that mutual assured destruction of the first type of retaliatory emphasis is primarily aimed at valued cities of the opponent and not at military systems. And indeed some of that is inherent in the initial philosophy of the SALT and ABM period, when, as you recall, we limited the accuracy of our own missiles by legislation so that they could strike cities only and not Soviet military targets.

Senator NUNN. Well, if you define it in the broader context instead of the narrower context, would mutual assured destruction in the broader context—that is, the ability to retaliate against targets of our choosing, including hard targets, soft targets, high value targets, military targets—if it was used in the broader context, would that be inclusive enough to define our policy today as we now sit here?

Mr. IKLE. The present policy, not the one we are driving at?

Senator NUNN. Yes; the one we have at the moment.

Mr. IKLE. Yes; in that broad sense.

Senator NUNN. How long, if things go as well as possible, how long will it be before we could move away from that mutual assured destruction doctrine under this SDI? I mean what would be your range of years? I am not asking for a precise year.

Mr. IKLE. There are two aspects of that policy of MAD as generally understood. One part is a commitment not to try to defend yourself. The Soviets have spent half of their money since 1972 on trying to defend against air attack and against missile attack. So in that sense the Soviets do not adhere to that policy as we do, and the question of how fast we could get off, depends on the speed—and General Abrahamson commented on that earlier—with which we could have ballistic missile defenses and, if we wish, air defenses.

Senator NUNN. Would it be fair to say that for the next several years, maybe as long as a decade, we will still be relying on mutual assured destruction in the broader context as we are today?

Mr. IKLE. It would. The United States will have to rely on the deterrent effect of a retaliatory strike.

Senator NUNN. We will have to continue.

Mr. IKLE. And not count on strategic defenses protecting us for many years to come.

Senator NUNN. Would you say that would probably be true through the rest of this century?

Mr. IKLE. I do not think so, given what General Abrahamson said. In the next decade we can have defenses.

Senator NUNN. Defenses and retaliation together. You are not saying that by the end of this century we might be able to phase out all offensive retaliation, are you?

Mr. IKLE. Depending on what we can achieve in agreed reductions.

Senator NUNN. In arms control. But for the next what, 5, 6, 7, 8 years we are going to be relying on mutual assured destruction or the ability to retaliate in the broader sense?

Mr. IKLE. I would prefer to phrase it in the second way. We are going to be relying on our ability to retaliate in the broader sense, yes.

Senator NUNN. The reason I asked this question is in Secretary Weinberger's speech of December 19 it is not entirely clear to me which definition of mutual assured destruction he is using. He does not define it precisely. But he just says:

> Today supporters of the traditional simplistic MAD concept supply most of the criticism of the President's strategic defense initiative.

Do you know what he means by "traditional simplistic MAD concept" there?

Mr. IKLE. As I understand it, by relying on retaliation only and banning defenses you have stability.

Senator NUNN. But is that not what we do now?

Mr. IKLE. We do not have stability. We have not had stability since 1972, nor did the Soviets rely on retaliation only. They put half their money in defense.

Senator NUNN. By not having stability you mean we do not have the ability to survive with a sufficient number of forces to retaliate today?

Mr. IKLE. Sorry, stability in the sense of the arms buildup being stabilized.

Senator NUNN. Well, the point I am getting at, Secretary Weinberger says, in describing the MAD concept—and I do not know whether he is talking about narrow or broad. I know it is used in several different ways, but as we have established, if it is broad, that is where we are now and will be for at least the next good many years.

He describes it as traditional and simplistic. Later in the speech he says: "The disproven MAD concept." It just seems to me that it is getting pretty hazardous to define the system we now rely on, if that is his definition, as being disproven and simplistic, at least until we have something to take its place.

Mr. IKLE. What he was referring to there was the theory that by banning defenses we would stop the buildup in offensive forces, that the Soviets would not continue to build up because they would have no incentive since we were not defending, and hence we could give up further buildup in our offensive forces.

Senator NUNN. All right. Well, that is not clear here. I did not see that definition, but I will take your word for it.

HIGH FRONTIER

Let me ask you, General Abrahamson, a couple of questions. I have here a brochure that I believe is published by High Frontier, Gen. Dan Graham, and so forth. Let me read you a couple of provisions from it and see if you agree:

> The High Frontier defense system is designed to increase the United States' ability to survive and respond to a Soviet first strike and thus to act as the strongest possible deterrent to nuclear war. Individually, each component of the system in itself offers tremendously increased deterrence. Taken as a whole, the system provides a deterrent to Soviet planners that can destroy up to 95 percent of Soviet ICBMs.

Is that a present capability?

General ABRAHAMSON. No; the High Frontier is a specific set of hardware proposals that that group of people have been recommending as opposed to the strategic defense initiative, which is indeed an examination or research looking at a series of various options in order to determine which is the most cost-effective and the most effective.

Senator NUNN. So there is a definite distinction between what is called High Frontier and what is called the strategic defense initiative?

General ABRAHAMSON. Yes, sir, that is absolutely correct.

Senator NUNN. Let me read further here. It says:

> The heart of the first level global ballistic missile defense or GBMD-I is a network of small space satellites. These satellites or carrier vehicles of more than 400 in number would be placed in 300-mile orbits above the Earth, reading rapidly. Each satellite in the system is capable of deploying numerous small heat-seeking interceptor missiles. As the satellite moves along its orbital track, the coverage range of its interceptors increases in an expanding sphere.
>
> By placing large numbers of such satellites in overlapping orbital tracks, continuous coverage of all required target areas is assured. In the event of confirmed missile launch, sensors can easily track and home in on the heat from the missile's exhaust. Once the enemy's trajectory is known, then the interceptors are launched and can destroy the enemy missiles prior to the deployment of their multiple nuclear warheads.
>
> It must be emphasized here that most of the technology for GBMD already exists. Given already committed development resources, the system could be launched, deployed and serviced by the Space Shuttle in five or six years, or less and at a cost that is a very small fraction of our overall defense budget.

Would you give us your view of that? Is that something that we can achieve now or within the next 5 or 6 years?

General ABRAHAMSON. In terms of the weapon system itself, one of the more mature technologies that we are talking about and we refer to that concept as a space-based kinetic kill vehicle concept. We do not necessarily go anywhere near the level of definition that the High Frontier has in terms of saying exactly how many might be in a satellite of a particular kind.

However, it would take more and I emphasized this earlier before you came in, sir, than just a group of weapons in order to have an overall SDI system. It is very fundamental that you must also have a tracking capability, a surveillance capability, a command and control capability that would be operative as well, and there are options for that.

Senator NUNN. My question is does this describe the Strategic Defense Initiative Program? Is it really achieveable in 5 or 6 years? Do you agree with this or not?

General ABRAHAMSON. The point that is being made is that for that particular concept that is a concept that is simpler than many of the others that we are looking at it. I cannot come anywhere near guaranteeing that it is a 96-percent effectiveness level or any number of that particular kind.

But it is an area that we do feel falls in the category of mature technology. It could be employed earlier. It could be employed against today's generation of strategic missiles in such a way that it would give us an initial partial capability for boost-phase systems. However, that could only happen if in addition to that we did have a full command and control capability and a surveillance capability that went with it.

Senator NUNN. Is that your way of saying you agree with this or disagree?

General ABRAHAMSON. I am saying that it is more complex than is suggested just right there in that particular article. I am saying that I agree that that particular concept is one that is much earlier than many others in terms of the weapon and the weapon alone. But the tracking that has to go with it——

Senator NUNN. You are saying the tracking and what else has to go with it?

COMMAND AND CONTROL

General ABRAHAMSON. And the command and control.

Senator NUNN. All right. How far away are we from—I am just trying to get the idea of whether this system is indeed something we can do within 5 or 6 years.

General ABRAHAMSON. In 5 or 6 years. I do not believe that a full command and control set could be included in that kind of a system yet. That, however, is an area that we are examining, along with a set of what we call the mature technologies of things that might be options that should the President in the future decide yes, he would like to go ahead, and that particular weapon concept, tied together with a surveillance concept and a command and control concept, might be one that is attractive.

Senator NUNN. Well, how long? You are saying that this concept, part of it, is available now and could be done within 5 or 6 years, but you are saying command and control and tracking could not be done now.

General ABRAHAMSON. Command and control is a tough, long business.

Senator NUNN. Are you talking about 10 years, 15 years? What?

General ABRAHAMSON. I think in a decade or less one could put together with a concerted effort in command and control and sur-

veillance, an initial capability. Now whether or not you could afford to get it all up there and have it in enough depth that you can reach that level of effectiveness, I have not made a responsible look at that, nor have I looked at what it would cost.

Senator NUNN. Well, we have got a respected former head of DIA saying this, and I just wondered. It seems to me that if you really believe that it could be done in 5 or 6 years you would have already looked at that. I mean, we are talking about spending 8 or 10 years to just do research.

Either you agree with this assessment, it seems to me, and it would be a high priority, or you do not agree with it. And if you do not agree with it you ought to say so, because there are an awful lot of people around the country that are confusing this with SDI and believe it is the same thing and really believe we are about to deploy a system.

General ABRAHAMSON. We are not about to deploy a system. I am only allowed to proceed through a research and technology phase. That research and technology phase has to go through a broad group. I do agree that it is an attractive weapon concept that could be deployed earlier than any other.

Senator NUNN. Well, I am more confused now, Mr. Chairman, now that my time is up, than I was when I started the questions. I might come back to it.

General ABRAHAMSON. I have a few charts that I will show you, sir.

Senator NUNN. If it can be done in a reasonable timeframe, why are we not doing it? Why are we engaged in a long-term research project on other things that may or may not. I do not understand your answer.

General ABRAHAMSON. Once again, the reason for embarking on a research program and one that has—could I have the phase chart, phased sets?

Senator NUNN. I am sorry, Mr. Chairman. I have already taken up enough time. I will come back on it.

Senator WARNER. It may well be that the answer is that eventually, when you decide on the matrix for SDI, it might incorporate one or more aspects of the program known as High Frontier.

General ABRAHAMSON. Yes.

Senator NUNN. Just to close it out, why spend $28 billion over 6 or 7 years researching something that we already, by your testimony, have existing technology that we could do in a shorter period of time?

General ABRAHAMSON. Because, sir, if we stop with one particular system and we just stopped right there at some partial capability, we may be, number one, driving the Soviets in the wrong direction, if it was clear to them that it was only a partial capability. And, second, if somebody—and they have very smart people on their side—found a way to deal with and counter just that one simple or a single concept system, then in fact we would be more vulnerable and we would be in a dangerous situation.

Therefore, part of our architecture and part of the philosophy is that you would always use more than one concept and hopefully ones that are coming along and becoming more countermeasure resistent.

Senator NUNN. I thought we were talking about not an Astrodome to begin with, but we were talking about some interim stages of protecting perhaps ballistic missile fields, that gave us additional deterrence, ability to retaliate. It seems to me you have just projected that we are going after the perfect. Until you get the perfect, you are not going to do anything.

General ABRAHAMSON. If I may be allowed to show you the one chart which I think at least puts these in perspective, and this is the way one eventually meets the SDI goal of a very reliable defense. The President long ago indicated that a thoroughly reliable defense is a very, very effective one, one that can be so effective that it can make missiles essentially obsolete or certainly reduce their military value at a low enough level so that people will be willing to—they will not assume this omnipotent kind of position that they presently have as a weapon, which, of course, makes them valued and not willing to give up in negotiations.

Now there are many ways to take a look at all of the technologies that one does include here, and as we look at several different kinds of options. I have chosen one way to put it in the category of mature technologies, things that are more innovative and coming along later, and then some final innovative things that might be very, very effective in the long future.

I indicated in my testimony last year that if for some reason we in the United States started out with a system—now remember that the research and technology phase is all we are talking about—but if for some reason there were a national decision that the members of this body or a President, together with allies, decided we should go ahead, then we would be starting up some kind of a curve in terms of effectiveness.

So I am showing effectiveness on the lefthand side. I do not have it numbered because I want to avoid this question. It is going to be 99.9 percent effective or not. I think it is premature to be trying to say those particular kinds of things.

You would want to have a technology that could be initially a fairly robust kind of defense. You do not want it to be 10 percent effective or 20 percent effective; you want it to be good enough so it has real military significance. In the category of mature technologies, if you consider only the weapons, then the space-based kinetic energy type of vehicle falls in that blue kind of category.

Senator NUNN. Is that what General Graham is saying here, that you are describing his system as being under that blue chart, the mature technologies, initial robust defense?

General ABRAHAMSON. Yes, sir.

Senator NUNN. And you are saying we could achieve that soon, in a very short timeframe?

General ABRAHAMSON. We could, if there were a national decision and if I had the other parts of the system, go ahead with that, and I have another chart which will begin to show what that means.

Now at the same time——

Senator NUNN. Well, there is not going to be a national decision until you tell us what can be achieved, in what timeframe, and what amount of money is going to be involved. How are we going

to get a national decision if we keep talking about innovative technologies way out in the future? We could go on forever with that.

I mean, it seems to me the national decision has to be based on what potential in the near-term and long-term is, and you seem to be avoiding that question.

General ABRAHAMSON. Well, it is because I do not have all the final answers yet. I have not fully studied, for example, just exactly how one could countermeasure that kind of a system, because if it were easily knocked out, then I would have certainly led the whole country down exactly the wrong trail. I am not trying to be a reluctant advisor in this. I am saying that there is a certain amount of investment that must be made so that I can bring a responsible decision not only to this body but to my bosses and to the President of the United States.

Senator NUNN. Well, I agree with that completely and I think that approach is to be commended. But then are you saying General Graham has not made that kind of analysis and therefore this is not a sound concept at this time that has been thought through?

General ABRAHAMSON. I am saying that what General Graham has done in his particular organization is he has used resources of certain people, certain companies, he has gotten some initial advice. He does not have available to him the resources of a full, very careful program that is laid out to investigate countermeasures and to do all of the command and control systems that are part of it.

Senator NUNN. So you are saying you do not buy this analysis now?

General ABRAHAMSON. I am saying that that is a good start. It could be a good start. I do not know if it is the best one, and I am not today in a position to say that that is what we ought to do.

Senator WARNER. I am going to interrupt here. Gentlemen, what I did was try to accommodate several members who could not stay for the full direct presentation of both witnesses, and I have put the General at something of a handicap. I would hope that we could complete Mr. Kennedy's questions, then allow the General to supplement whatever testimony you have given thus far with a direct presentation and then go into a second round of questions.

Senator KENNEDY. I do not want to take much time on this, but I just——

Senator WARNER. Senator, you have been very patient. You take your time on it.

Senator KENNEDY. I want to express my appreciation to both the witnesses. When I came in there was another chart on the board that showed that the increase for the SDI research had only gone up to 30 percent of the R&D budget. That was the earlier chart that you had here when you were comparing it with other weapons systems.

General ABRAHAMSON. No, sir. We have gone up approximately 2.6.

Senator KENNEDY. Compared with the Apollo project. Now you have SDI at 30 percent, 1986, right? Thirty percent R&D. See the 30 percent there. SDI, 1986, 30 percent.

General ABRAHAMSON. Thirty percent of what the Apollo program did.

Senator KENNEDY. Oh, that is not 30 percent of the new R&D budget?

General ABRAHAMSON. Oh, no, sir.

Senator KENNEDY. I understand.

General ABRAHAMSON. It has gone from 1.5 to 3.7.

ABIDING THE ABM TREATY

Senator KENNEDY. As I understand from what your responses were to Senator Levin, and just another bottom line, he drew a number of conclusions. One of the conclusions that I would have to draw from your response, Mr. Ikle, would be that you are going to be telling the Soviet Union that the ABM Treaty is out as far as this President, this Secretary of Defense, and our bargaining position. The only question is when.

Mr. IKLE. I think that distorts the time scale a bit. We are abiding by the ABM Treaty and we want the Soviet Union to abide by it, and that is what we will tell them.

We also will tell them that we are going to look toward a future where we can, hopefully together, work for a reduction in offensive arms and permit defenses, in which case the initial concept of the ABM Treaty, to be sure, would be changed.

Senator KENNEDY. Well, another way of putting it, I mean, that is perhaps one way of putting it, but I think another way of putting it is that we would like you to stop the development of your radar. We listened to a very eloquent presentation by Mr. Perle the other day about all the violations of the Soviet Union on a range of different kind of agreements.

We would like you to stop work on the radar and we would like you to conform to other treaties, but I want you to know, Mr. Soviet Union, that we intend to basically abrogate the existing ABM at some time in the future. It will be at the time when we are going to be prepared to test. That may be 5 years. It may be 7 years.

But it was the testimony before the Armed Services Committee by Mr. Ikle, quoting the President and the Secretary of Defense, that that issue of research and development was not on the table for negotiations and that the issue, if it goes forward and is successful, about the deployment is not for negotiation.

I do not see how any Soviet negotiator is going to draw any other conclusion than that the decision has been made by this President, this Secretary of Defense, and by you as the arms control official that that treaty effectively, as it exists today, is going to be abrogated.

Mr. IKLE. It is not a decision we can make today. We do not have the research finished, nor is it the time for it.

Senator KENNEDY. Aren't the results of that process which you have announced to move ahead completely in terms of R&D and at some time, as I understand it 5 or 7 years, you are going to go ahead and do the test, which would be the violation? You have indicated that that is going to move ahead. That is your testimony today, and that is effectively going to abrogate the existing treaty.

What I understand you to say is that after we do the research and development and if it does work out, which we intend it to do,

and that is not negotiable, and we intend to then move toward a deployment and we are prepared at that time to go into discussions in terms of managing that particular system and altering at some future time the ABM Treaty, that is what I am getting from your testimony.

If I am wrong, I would like to be corrected.

Mr. IKLE. Well, it clearly follows from the preferred future that the President articulated, of getting rid of offensive systems and permitting defensive systems, that you would no longer be bound by the ABM Treaty in the future. That follows like two and two add up to four.

Senator KENNEDY. I know it is difficult to imagine, but if you were a Soviet defense official and you just heard that statement made by the arms control, what kind of weight would you give to anyone that would ask them to now move toward continued compliance with ABM?

Mr. IKLE. In the interim period I think it is in their interest to comply, if they want to have arms control, to comply with any of the arms control agreements. If they want to depart from the ABM Treaty now, there is a way of doing it. They can come to us in a conference. They can tell us we think it is important to build this radar and let us negotiate about doing this in the interim period.

But they are denying they are violating it. This is not what we are planning to do. We are planning to abide by the treaty.

Senator KENNEDY. Until we are prepared to test, until we make up our mind when we think it is most appropriate?

Mr. IKLE. We are not violating the treaty. We plan to discuss this.

Senator KENNEDY. But you are sending a very clear message, are you not? You are going to say look, we are going to abide by the terms until we are prepared to test, and then we are going to give them a breakout and then we are going to notify the Soviet Union. That is our intention. We intend to break out of a treaty on our own time.

So we are asking you to conform with the treaty even though we have every intention of conforming up to the time that we intend to break out.

Mr. IKLE. Well, there is a big difference between proposing to renegotiate a treaty when the time comes and clandestinely violating a treaty. And what is envisaged in this future that the President articulated of reduced offensive forces but maintained defensive forces would lead to renegotiation of the treaty.

Senator KENNEDY. What are we prepared to do if they refuse at Geneva to abide by the ABM Treaty now? What if they refuse to?

Mr. IKLE. We are now engaged, as you know from yesterday's testimony, in a continued reassessment of the implications of that violation as well as some other violations and what responses we would have to take as this pattern continues.

Senator KENNEDY. As we move forward and as we move through this process of renegotiation, I guess is the word to use for a new ABM Treaty, what if they refuse to negotiate? What kind of position would that put us in then?

Mr. IKLE. Well, it is quite distant. We are now involved first in research on seeing how soon a deployment might be feasible, what

its effectiveness would be. I would not want to speculate now about us being unable to negotiate 10 years down the road with the Soviet Union on an approach.

Senator KENNEDY. You stated, I think, last year, Mr. Ikle, "if effective defenses against ballistic missiles can be developed, they will generate substantial disincentives against the proliferation of offensive arms." We are obviously all concerned about the possibility of the Soviet breakout of the treaty.

Secretary Weinberger has stated that it would have an extremely frightening prospect. What would be your advice to the President of the United States if the Soviets develop an effective defense? Would you recommend to the President in the face of that development that we reduce our strategic defense?

Mr. IKLE. Reduce it?

Senator KENNEDY. Yes.

Mr. IKLE. If they have an effective defense, we should abandon the effort to develop defense?

Senator KENNEDY. No, no. Would your recommendation be to the President of the United States that we reduce our offensive systems if they develop an effective defense?

Mr. IKLE. This is indeed the road that is recommended in my opening statement, that we both move to a reduction of offensive systems and greater reliance on defensive systems.

Senator KENNEDY. So if the Soviets moved toward——

Mr. IKLE. If they agree with us in going in this direction, why we can move together far more easily.

Senator KENNEDY. What if they do not? What is going to be your recommendation? I wonder if they develop a defense system and you are not able to get a successful negotiation. What is going to be your recommendation—increasing offensive?

Mr. IKLE. It depends on the time phase. In the short term, while we do not have defenses and cannot have defenses, there are short-term countermeasures to overcome their near-term defenses—penetration aids and such measures. For the longer term we would want to rely on our defenses, as they would be relying on their defenses. And we would thereby want to get out of this competition in building offensive arms.

SEEKING ASAT AGREEMENT

Senator KENNEDY. Would you agree the antisatellite weapons are likely to be one of the most serious threats to the survivability of defenses, and what steps are we taking now to try and get some kind of agreement on ASAT?

Mr. IKLE. There are many ways in which defenses might be attacked.

Senator KENNEDY. The question is what are we doing now to try and get some kind of agreement on ASAT. Is that going to be part of the negotiations?

Mr. IKLE. As we reported to Congress, I think about a year ago, we have not found a way of separating out a verifiable ASAT agreement from all the other space activities, including even testing of offensive systems.

Senator KENNEDY. Either the General or Mr. Ikle, could you tell us what the particular problems are in terms of dealing with the SLBM's?

Mr. IKLE. The submarine-launched ballistic missiles?

Senator KENNEDY. Yes.

Mr. IKLE. I am sorry.

Senator KENNEDY. Well——

Mr. IKLE. Oh, defense against?

Senator KENNEDY. Yes. What particular problems does that present.

Mr. IKLE. For defense?

Senator KENNEDY. For defense.

Mr. IKLE. I would like General Abrahamson to take this one.

Senator KENNEDY. Fine. Given where we anticipate the Soviet Navy to be in the 5 or 7 years.

General ABRAHAMSON. It is not a fundamentally different problem than we have with an ICBM or an SS–20 type system. There is still a clearly defined boost phase and so long as there is we have an option to try to develop a boost-phase killer. There is a smaller midcourse phase associated with that——

Senator KENNEDY. If I could, Mr. Chairman, just continue this line. The only problem is, as I understand, with the ICBM's, you target those. You know where the launchers are. Submarines——

General ABRAHAMSON. Oh, I see. Sir, this is something that I think many people in fact have a misinterpretation about, and this is why I have tried to emphasize the surveillance systems. We have to be able to have a capability to pick up a missile launch, no matter where it might be, whether it comes from a missile silo that is known or whether it comes from what we now call in our bureaucratic way imprecisely located targets, meaning we just flat do not know where they are, or from the ocean.

It is not a limit in what we are trying to do to be able to start from a known location. That is critical.

Senator KENNEDY. My time is up. Thank you.

Senator WARNER. I thank the Senator.

Now, General Abrahamson, we would like to afford you the opportunity to go back. Your entire statement will be made a part of the record and it is my understanding that you have some testimony here which gives a brief summary of it. One of the advantages of having had the questions, you now know the concerns of the committee.

General ABRAHAMSON. Yes, sir. I surely do.

Senator LEVIN. Mr. Chairman, could I ask Mr. Ikle one question, because I cannot stay for this part of the presentation?

NEGOTIATING WHETHER TO/OR NOT TO DEPLOY

I am just uncertain as to what Mr. Ikle told us in one critical area. It seems to me we are telling our allies that if space defense is feasible, if the research shows that it is feasible, then it is this administration's policy that we would negotiate whether—I emphasize the word "whether"—to deploy it. It seems to me that is what we have told our allies.

You are telling us today that it is this administration's policy, that if it is feasible, not to negotiate, if it had its way and were in office. It would not negotiate whether to deploy it but simply how to deploy it.

Mr. IKLE. Well, if you are saying, Senator, that we told our allies or the public that we would give the Soviet Union a veto——

Senator LEVIN. No, no, no.

Mr. IKLE. Well, that is what "negotiate whether" can mean.

Senator LEVIN. Negotiate whether to deploy.

Mr. IKLE. Well, if they say no, they would have a veto, right?

Senator LEVIN. Mr. Ikle, it seems to me we have just got to focus on this very critical issue in terms of what we are telling the American people and the world. If research proves it is feasible, if research proves it is feasible, then is it our intention, our policy now that then we would negotiate whether to deploy them?

Mr. IKLE. What I hope would be is to have continuing negotiations which will start in Geneva, to be continuing those, about the transition to defenses, the timing, the phasing, but we have not said that we would give the Soviet Union a veto. That is to say, if in these negotiations they say no, you must not deploy, that we would thereby——

Senator LEVIN. Well, I promised the Chair I would ask one question, but it has not been answered. Is it our policy that whether or not we would negotiate it if it proved feasible would be negotiable at that point? Would we negotiate whether to deploy it if it proves feasible? I cannot ask a question more simply than that.

Mr. IKLE. Well, I think I have answered that.

Senator LEVIN. No, you have not. You said you will not give them a veto. Will we negotiate it? I am not saying we will give them a veto.

Mr. IKLE. I am trying to define the meaning of your word "negotiation."

Senator LEVIN. Is it the subject of negotiations? Will we sit down with the Soviets at that point and negotiate whether or not to deploy it? I am not saying agree with the Soviet Union. I am not saying give them a veto. Will we then sit down with the Soviet Union and negotiate whether to deploy it? That is my question.

Mr. IKLE. Well, I am hardpressed to get the meaning of that negotiation. We negotiate whether to deploy and they say no, what is it we do then?

Senator LEVIN. Then we are not willing to negotiate whether.

Mr. IKLE. So they would have a veto.

Senator LEVIN. No, not at all. If we do not reach an agreement, we can just go ahead and deploy.

Mr. IKLE. So we would negotiate for a while and then if they disagree we would go ahead?

Senator LEVIN. Of course, go ahead and deploy it. Absolutely. But will we negotiate the question? Will we negotiate whether to deploy if it proves feasible?

Mr. IKLE. I am not sure what the point is of that negotiation. We negotiate for a while and if they say no, we go ahead anyhow?

Senator LEVIN. If you want to, sure.

Mr. IKLE. So we have a pause while we discuss things.

Senator LEVIN. Mr. Ikle, the President said that we would negotiate whether we would deploy it if it proved feasible. What did he mean? I am quoting the President all this time.

Mr. IKLE. I am not sure what quote you are referring to.

Senator LEVIN. Well, let me read it to you. I am sorry, I have taken too much time.

Senator WARNER. No, no, it is all right. It is an important issue and I am perfectly willing to afford the Senator additional time to work it out in the hopes the witness can clarify the record.

Would the Senator be kind enough to refer to the speech, date, time, and the quote?

Senator LEVIN. I will, but I think I am probably abusing the Chair's time on this.

Senator WARNER. No, the Chair is concerned about this part of the record likewise.

Senator LEVIN. All right. January 12, 1982, press conference. This is what he said on negotiability:

> We have also made it clear that if research does come up, as we hope, with something that could be the defensive weapon we are talking about, then we would, we would be willing to go into negotiations and discussions with the other nations of the world and with our allies about what to do about that, and whether and how to deploy.

Now what did he mean?

Mr. IKLE. I cannot interpret the President's meaning in a press conference beyond what he said. Obviously we have been discussing this with our allies and we are discussing it with the Soviet Union, and there will be questions raised, objections raised. We will be addressing those. So I think in that sense we are going to negotiate.

Senator LEVIN. Thank you, Mr. Chairman.

Senator WARNER. The Chair would ask the witness in the near future to go back over the Presidential statements on this issue of the extent to which any portion of this program or any future research and development might be subject to the arms control talks. Then, if you would, state in chronological order the President's observations on this point, and then put in side-by-side whether or not today there has been any deviation from that as we approach the opening of the talks in March. The Chair and the other members of the committee would find that a very valuable side-by-side comparison.

[The information follows:]

SDI AND ARMS CONTROL NEGOTIATIONS

PRESIDENTIAL NEWS CONFERENCE OF JANUARY 9, 1985

QUESTION. Mr. President, if you are flexible, are you willing to trade off research on "Star Wars" technology for deep cuts in the Soviet nuclear arsenal, or are you set in concrete, as your advisers say, against any negotiations on "Star War"?

The PRESIDENT. Well, let me say, what has been called "Star Wars" —and, Helen, I wish—I wish whoever coined that expression would take it back again——

QUESTION. Well, Strategic Defense——

The PRESIDENT [continuing]. Because it gives a false impression of what it is we're talking about—but that will be on the table with everything else, of course. There are no preconditions with regard to the talks that we're going to have.

But this is research, a research program, and it is within the provisions of the ABM treaty. So, all that we've made clear is that we're going forward on the research, but we've also made it clear that if that research does come up, as we hope, with something that could be the defensive weapon we're talking about, nonnuclear,

then we would be willing to go into negotiations and discussions with the other nations of the world, and with our allies, about what to do about that and whether and how to deploy.

QUESTION. May I ask you, then, if "Star Wars"—even if you don't like the term, it's quite popular—is on the table for negotiations at some point where the technology might be developed?

The PRESIDENT. Well, as I say, it's on the table only because we made it very clear——

QUESTION. But I mean it's not just a bargaining chip——

The PRESIDENT. No. Oh, no.

QUESTION [continuing]. That could not be bargained?

The PRESIDENT. No, No.

INTERVIEW WITH BERNARD WEINRAUB AND GERALD BOYD OF THE NEW YORK TIMES, FEBRUARY 11, 1985

QUESTION. Mr. President, to go back to the issue of arms control and particularly, to your Strategic Defense Initiative—if, in the Geneva negotiations, the Soviets were to agree to go along with the deep reductions in offensive weapons that you've proposed, would you still want to proceed with this Strategic Defense Initiative, or would you be ready to call it off in return for that?

The PRESIDENT. No. I would want to proceed with what we're doing, which is research to discover whether there is such a weapon and whether it is practical and feasible. And then I, myself, have said that my own view would be that it that is determined and there is—we can produce such a weapon, that then before deployment I'd be willing to sit down and, in a sense, internationalize.

In other words, to negotiate then, before there would be any deployment or anything, to make sure that they understood that we weren't trying to create the ability of a first strike ourselves, that we're—our goal was still the elimination of nuclear weapons; and that I would see that defensive weapons as another step in attaining that goal; that if we could say that his virtually makes those weapons, if not obsolete, certainly most ineffective—the nuclear weapons—then we've got a real reason for saying, "Now, let's all do away with them, because we've come up with this defensive weapon." That would eliminate any of the protests that some of the people on the Soviet side have made that we're seeking a first-strike capability.

I don't think anyone in the world can honestly believe that the United States is interested in such a thing or ever would put itself in that position.

PRESIDENTIAL NEWS CONFERENCE OF FEBRUARY 21, 1985

QUESTION. Mr. President, if you and Mrs. Thatcher are correct that the Soviets plan to hold hostage any progress on intermediate-range and strategic weapons in the talks in Geneva in return for concessions on your part on your space defense program, how far are you willing to go in getting concessions to get an arms agreement?

The PRESIDENT. We believe if the Soviets are sincere in the statement they've made about actually wanting a reduction and even the elimination of nuclear weapons, they'll stay at the table and negotiate with us. All that we have proposed and all that we're doing is engaging in research, which is legal within the ABM Treaty—we're not violating the treaty.

And I have said repeatedly, and Prime Minister Thatcher is aware of this, that if our research does produce the possibility of such a weapon, a defensive weapon that could alter the balance, then I would be willing to come forth before any deployment and negotiate and discuss the deployment and the use of that weapon in such a way that it would be used to rid the world of the nuclear threat, not to give us any particular advantage over anyone else.

The talks in Geneva have been approached by our side with the objective of discussing with the Soviet Union how both parties could agree on a stable transition to offensive arms reductions (and eventual elimination) combined with increasing reliance on defensive systems.

Senator LEVIN. Thank you, Mr. Ikle and General. I am sorry I cannot stay.

Senator WARNER. Now, General, you may proceed.

STATEMENT OF LT. GEN. JAMES A. ABRAHAMSON, DIRECTOR, STRATEGIC DEFENSE INITIATIVE ORGANIZATION—RESUMED

General ABRAHAMSON. Yes, sir.

I do have, of course, written testimony and I will save everybody going through many pages of it.

Senator WARNER. I have done it, as have other members of the committee, and that is one reason we went directly to the questioning period.

General ABRAHAMSON. I will try to go as quickly as possible through——

Senator WARNER. Take the time that you need. This is a very important presentation.

General ABRAHAMSON. And with some of the issues that have come up to put them in some perspective, and again also to provide a clear definition of the program, the lack of which we seem to be suffering from, that it is a clear problem.

Let me indicate that what we have approved at this point in time is a research and technology program, a research and technology program that is aimed at finding the means—and that is all of the means—to counter or, that is, to destroy ballistic missiles of all ranges that might threaten both the United States and our allies.

Now that does encompass a rather broad kind of challenge as one goes ahead. It means a very broad kind of a research program and unfortunately all too often much of the effort is aimed at the weapons. But in fact the largest amount of money is not to be used in the area of the weapons, and I will try to take a slice through some of the technology in order to give people just a better understanding of what that particular phrase means.

Now when we have a research program of this kind obviously it has to be managed and run in a very tight manner, and one of the things that we came to the Congress with last year was a request that we consolidate what had been previously many, many particular line items of research with small objectives into five line items of major objectives.

Those five line items and the intent of doing that was to allow us to provide what we thought would be an appropriate level of insight to the committees who will obviously and appropriately be looking at what we are doing, trying to judge if we are doing that correctly, and by the same token not be faced with the terrible delays that one often has if we had to reprogram every time we came on a change or a change in priority or a problem that would develop as one wished to proceed or accelerate something that makes sense or, in another case, decelerate or stop something that does not make sense.

I think that is my responsibility, both to Secretary Weinberger and certainly to all the Members of the Congress. Therefore, we have consolidated into those particular five items.

Our proposal last year, as you will recall, was for a Department of Defense budget which was nearly $1.8 billion. That was cut by approximately 21 percent, and we did have to make some very difficult decisions in order to accommodate that action by the Congress. I would like to thank the members of not only this committee but the other committees who finally in the end decided to let

the allocation of this reduction be a matter of judgment by the management of the program, because I think that that is important.

Otherwise, we will in fact be faced with a constantly unbalanced program, and balance is a key to being able to proceed as quickly and as effectively as possible to some operational capability.

As you indicated, Senator Nunn, in terms of what were a legitimate series of questions, now our job is to provide options. I am a technical optimist. I believe in the team of people that has been assembled around this country, and I believe in the procedures that have been established, that we really do have a program that can operate quickly and responsively and by doing so provide the greatest return for our taxpayers and for all of you, and the greatest rate of progress toward the objective.

That objective is to have options so that a future administration, a future Congress, could examine first the technical feasibility of what we have done, examine that and say have you proven to us—remember, you must do this within the limits of the ABM Treaty—that you indeed have a system or the initial part of a system that we could go forward with including responsible cost estimates, and with responsible schedule estimates, and that would bring forward then something that would be capable at some level of performance.

I indicated and I did forget to underscore the fact that we must be able to conduct this within the limits of the ABM Treaty, and that applies differently in different types of systems. I will give you some examples, in fact, later on. But clearly we have to do that, as opposed to what is happening now, today, in the Soviet Union, where they are proceeding with research of exactly this type, in some cases more aggressively than we are.

In some cases clearly they are violating the treaty itself. In other cases they are staying within the letter of the law and proceeding, but still developing capabilities that might be exploited in ways that would not be effective for the United States or for our allies.

I indicated last year, and I report directly to the Secretary of Defense, I have a small number of people in a central program office that allows me to provide technical judgment on the systems that we are proceeding with. However, our philosophy is that the work is being done. It is distributed out to the Army, the Navy, the Air Force, in NASA, in the Department of Energy, in the Defense Nuclear Agency, wherever we have a team of management and technical experts that can best do that job.

So what that means is that we have a centrally planned and executed program to the extent that we are directing it centrally. However, we clearly consult with all of these experts as we make these judgments, and we rely on a decentralized execution program throughout all of the technical capability across the entire government. And, frankly, that also means obviously in our contractor communities as well.

I believe that we have established those procedures and those procedures are simplified procedures based on what we often have to do when we think in terms of a major program, such as an F–16 or an M1 tank. And all too often people think that what we are

talking about is the development of the M1 tank or Trident submarine, and we are not doing that.

We are doing development of technology to provide a base so that that could go ahead. I was responsible for the development of the F-16. I moved that from a program—not myself, myself and a team of very fine people and, frankly, then a team of very fine contractors, moved that within a period of just slightly more than 3 years from an initial prototype flight into initial production, in a very, very short period of time.

That was because we had stability. We had a clear understanding. But most of all we had a good solid base of technology on which to work. That base of technology had been developed in the F-15 program, the F-18 program, the engine program, and the avionics programs. That does not exist in every case for a strategic defense initiative that might eventually be opted for by a President as one goes ahead.

Now we are going from a budget of $1.4 billion up to $3.7 billion in terms of our request. A legitimate question on all of your parts is can you really manage that kind of a program. Are the procedures in place to be able to do that? The evidence of that ought to be the way we have at least started to execute that program in the fiscal 1985 program.

We did do that. In some cases we had to modify programs in order to stay within budget. In other cases we had to change course in order to ensure that a program that had been started historically a long time ago, leading in one particular direction, was now more closely aligned with the objective of the SDI program, this thoroughly effective defense built around a multi-layered architecture.

I am very pleased to report that after only one-third of the fiscal year has passed, and our program office has only really had authority over that money for that 4-month period, we already have been able to effectively obligate of that R&T money very nearly 50 percent, and I don't think we have done that in a wasteful way. I think we have done it in an efficient way, making proper management decisions as one goes ahead.

It is a complex program and I can see when people are saying yes, those are good ideas, let us go out and pursue those things, that we ought to be able to do that. But you should understand what that entails.

Could we have the space-based kinetic kill slide, please?

[Slide deleted.] Here is an example of what an operational space-based kinetic kill type of SDI might require. Now what I have shown up here in the upper lefthand corner is indeed the kind of description of a very simplified weapon system itself, and there are several versions of the way this could be developed and implemented and deployed. It is intended to be a boost-phase killer and in fact the greatest emphasis in our program is to find ways to in fact introduce boost-phase destructive techniques.

That does not mean that we are ignoring some of the terminal systems. We are not. In fact, we are spending a fair amount of money on every one of those. But we also know that being able to implement layered systems is where one really gets leverage so that an SDI can indeed be effective as one goes forward.

So that is an artist's concept of the kind of system that was described in that magazine under the High Frontier concept. By that I mean it would be a small, chemical type of solid-propelled rocket that would have to get up to a speed perhaps of 5 to 7 to 8 kilometers per second in order to be able to intercept rockets in a boost phase.

It would have to be aimable, but only aimable in a gross sense, because you would have to be able to develop on the front of that some sort of a smart guidance system so it could as it gets near to a booster or near to a warhead direct itself and have a maneuvering capability so that it would run into the booster and destroy the booster.

So this kind of a system, by the way, is flexible. It is potent and, Senator Nunn, I am trying to find ways to accelerate this within what the budgets would allow, but not by itself. That is the key.

It could be used in a boost phase. It could also be used, if properly deployed someday—and we are embarked on systems studies so that we can see what an effective deployment might look like—also could be effective in the post-boost phase, where you still have leverage in terms of being able to destroy a number of warheads before they have all split up, before all of the decoys are out and are aimed at separate targets and you have a very difficult problem. And eventually it could even be used in the mid-course phase also.

So this is a flexible idea. It is a good idea. It is not a bad one at all. However, listed across the top are the five program elements numbers that are being presented to you for your approval. Notice that one of them is SATKA [surveillance acquisition tracking and kill assessment]. In order to have such a system work we must first know that there is an attack under way, and you must know, as Senator Kennedy pointed out, where these missiles are coming from and we do not want to have to rely on the fact that we know that there was a hole there and, by the way, they had a missile sitting in that hole yesterday.

We have to be able to know that it is coming and coming from just anywhere as it starts. So there are satellite systems that are being looked at, different kinds of systems for different phases which could provide us not only that initial warning but also provide us a very close vector so that we know then we can steer those weapons and aim in the direction that one wants to go.

BOOST SURVEILLANCE TRACKING SYSTEM

The BSTS there is a listing of one of those kinds of satellite systems. That stands for the boost surveillance tracking system. That would be an infrared satellite that would be located in space, but in order to make that kind of a satellite work there are advances in technology that have to be brought forward so that at the particular time you put up that satellite to make that work you must be able to know that if those Soviets attack that with a nuclear weapon, for example, they could not easily countermeasure this entire system.

Therefore, the computer systems, the chips that are in it, such as LSI that I have talked about—the large-scale integrated circuits—

they must be radiation resistant. Otherwise it becomes easily countermeasured. Therefore, one of the kinds of things and areas of research is data processors for radiation-hard LSI. I can go through a whole series of those things to try to point out the scope of the research in order to bring that forward at an effective point in time.

And it is part of our management job to not let one of those get so far behind that we have one element that is lost and in fact we are then wasting a great deal of money because we have brought forward all of our industries and all of our capability then and we sit and we wait. That has happened and it has cost the American taxpayers a great deal.

I know about it because I looked at it back in 1979 when, as a result of program cuts, NASA was forced to make some very difficult decisions on how fast they would bring forward the space shuttle. And one of those decisions was just to save a few million dollars where they chopped out and stopped the work that Lockheed was doing on the tiles for the space shuttle.

And later on it was those tiles that they could not find effective ways. It took them longer than they expected to be able to mount them reliably. It delayed the first launch of the space shuttle by over a year and cost billions of dollars. So it is that kind of a problem that I am trying to talk about when I am talking about a coordinated program. There are a series of these. I will not go through every one of those. I will go back to some of them later on.

We have to do some pointing and tracking. Even though it is not the most accurate pointing and tracking for this kind of a system—it certainly does not have to be as good as a laser—I happen to have all of my pointing and tracking experiments over in the directed energy activity. In fact, that is one of the areas that I had to make a very tough, I had to bite a hard bullet, and that was to change, modify the TALON GOLD experiment, which was our only pointing and tracking system, make it more robust, broader, and make it more effective for our broader mission.

The same thing in kinetic energy systems themselves. We have to be able to have a fire control and a guidance system for each of those rockets that would work. Clearly the platform has to be survivable. In the other parts of the program, I have survivability and lethality efforts underway. I did not cut one penny out of that when we had that 20 percent cut, because that is the key to ensuring that we have a survivable system later on.

BATTLE MANAGEMENT AND C^3 system

Finally, I have to have a battle management and C^3 system. I am trying to get across to some degree why it is a complex program.

Senator WARNER. Excuse me. Before we leave that chart, it seems to me——

General ABRAHAMSON. I am not trying to say it is impossible. We can do this job. We really can, but it is not easy.

Senator WARNER. But before we leave the chart, in reading through your testimony earlier today and studying some of my other material, it seems to me that there is a certain aspect of this program whereby alteration of one segment might well have an adverse impact on a number of other different activities and, there-

fore, you must have a concerted effort to bring them along together.

General ABRAHAMSON. Thank you, sir. You said it much more exquisitely and shorter than I would. That is exactly true.

Senator WARNER. But then the follow-on question, having had some experience in weapons systems myself, does that make this weapons system unique say from the manner in which we developed the Polaris program and the manner in which—well, just take Polaris for example.

General ABRAHAMSON. No. It is just that it is broader and bigger than anything we have ever done in that sense before. In the Polaris system you really had to develop a boat. We had developed submarines before and we had to make advances certainly. We had to make one important advance. We had to make the nuclear engine work and work properly.

MISSILE SYSTEM

Senator WARNER. I understand about the boat. Let us talk about the missile system.

General ABRAHAMSON. But for the missile system itself it was a straightforward single kind of development. But here we are developing satellites, we are developing new forms of weapons. We are developing what will clearly be the most complicated command and control system that one has ever implemented before. It is a system of systems and I think that is the simplest way to describe and compare what you have just indicated, sir.

Senator WARNER. Please continue.

General ABRAHAMSON. Now to go back to the question that is clearly not only in your mind but many others, GAO investigators and others, are saying how is it and why is it that you need to jump up so dramatically. Now you can see when you begin to get down into the limits of the program there are many small programs, and here is an example.

In the midcourse, if one is going to use that kind of a weapon, one does not want to waste a lot of those shots shooting at decoys. You need to be able to tell the difference between a decoy and a real warhead. One of the concepts for that is an imaging laser. As one begins to look at it, we have never built an imaging laser of this capability before, ever.

In order to do that I have to break down and here I conceive that I have four different programs. Each one of these programs is going up into optics, tracking techniques, imaging and measurement requirements. As you can see, it breaks down smaller and smaller into programs that one can say can we slow that down? How about just chopping off 25 percent of that?

Well, there comes a place in every one of these things where if you chop out 25 percent what really happens is you lose the ability to go forward and make forward progress in any one of these. I just use this as an example, and there are some others that I will try not to spend too much time on.

Remember I showed large optics technology as one of those four programs. Well, large optics technology is not a single program. We have to be able to make this affordable. There was the question,

and it was a very proper question, about can we make the defense cheaper than the offense. That is part of this challenge as one gets there.

I call it again a fundamental cost inequality. That means that I have to make optics cheaper than we have ever made optics before. Right now, for the space telescope, we have an impressive optical mirror that was put together, and it took 4 years to make that mirror. It is the most accurate scientific instrument that has been made. It is going to go up in the space shuttle in 1986, hopefully, with a little bit of finger-crossing.

That costs a great deal of money. We cannot have laser systems or other systems rely on having a single mirror capability if every mirror that is a large one that we put out takes 4 years and costs $10 million or so. Therefore, we have our program broken down into looking at new ways of polishing mirrors, looking at infrared types of mirrors, which are different, looking at segmented mirrors that will correct themselves for optical mismatch in terms of the way the laser might go forward.

That is another example of the level of complexity and the level of balancing that we have ahead.

Let me just kind of stop. I think I have made the whole point. If that small kinetic energy kill vehicle is indeed going to work—and it is not that tough, it really is not—better to put some money into making it small enough that it can work and be small; otherwise, you have got to put a great big rocket up there, and if you put a great big rocket up there you have to put lots of shuttle flights up or we have to have a large booster in order to put it up, and it costs a great deal more.

Therefore, one of our challenges is to see if we can get this small front end that will be the destruction vehicle for the systems that one goes at. Now is that a very large kind of a problem, to go from $4 million to $18 million in order to squash down something that right now, for the ASAT, weighs 35 pounds, and we would like to get it down on the order here of some 17 kilograms, about 7 or 8 pounds, as one begins to look at it?

So you can again see some of the relationships. I was not trying to evade your question. I am certainly not trying to say that we are going to be timid about the program. In fact, for portions of the program I have tried to set up what I call horse races and they are not only the contractual horse races where we have tried to invent new procurement concepts that will be faster and that will induce our contractors to work more effectively, but in fact have teams of researchers that know in a friendly way that they are working against each other and that they are competing, and it is their performance that is going to make this system work.

In fact, and I guess I would like to go back, when I go out and talk to people very often—I had the great good fortune of being asked to give the graduation address to Rensselaer students last spring, and I talked about what I thought was going to be a very optimistic future for all of these young people, and not just because we ought to be able to preserve our world with this kind of a change in fundamental strategy, but because I thought we were making advances in the space program, in medicine, in information processing, in all areas of mankind.

I thought it was a wonderful future for everybody, and there was a lady professor there who came at the very end and offered the convocation. I obviously did not reach her, because she ended her prayer with, "And the Lord save us from the technocrats."

Members of this committee, I am not a technocrat, and this program is not made up of technocrats. We are made up of—this is a human program and I have to say the most human program, the one that people believe in our objective and are willing to horse race, to be competitive, and find a way to make this happen.

It is happening all around, with thousands of people across this country already. But they have to have the resources in order to be able to move out and to do that job. And that is why we are asking for a very large increase on a complicated program.

Can we do this? Is there a difference between what Dr. Ikle said earlier and what my testimony says? I do not believe so. I think it was expressed differently, perhaps, but was there a fundamental difference? Not at all. I am a technical optimist that believes in those people that can do that job, and I feel that the answers will be positive when they come out.

However, my job is to be a program manager and not to promise falsely but to give you my best possible assessment as we go through. I feel very confident that 4 or 5 years from now, in fact in the early 1990's, we can offer our allies and our administration, whomever may well be sitting in your chairs at that time—and I hope for the country that you are—that in fact you will have a positive option.

Dr. Ikle indicated that under those kinds of circumstances we as a Nation would probably want to go ahead because the potential is so significant, and I think yes, there is no difference between that, but I have got a job to do between now and then to make that happen.

Senator NUNN. General, may I ask one question? Do you have another team of people that are called Red Team and you are the Blue Team, that are basically given a good bit of funding and told to take steps to counter this system as you go along so that they would also be countering. It seems to me that is the difference between this and any other program like the space shuttle.

We are not dealing against nature here; we are dealing against nature plus an adversary that obviously, unless we reach an agreement—and I hope we do—is going to take every step they possibly can and spend the money they have to counter this. So do you have a Red Team that is trying to counter everything you do as you go along?

General ABRAHAMSON. We do. It is not as fully filled out nor is it functioning as fast or as well as I would like to have it at this point in time. That is a very peculiar group of people, special ones, that have to be there, but it is not one Red Team, it is a dozen Red Teams. There is already a Red Team down at the Army at Huntsville that has been operating. We have several studies going on in our horse race procurement and what I call our pilot architecture study.

In that pilot architecture study yes, there is a Red Team that is operating at that point in time and trying to punch holes in what we are doing. So the answer is yes, but I have to say also that it is

not as filled out with all of the quality people that I want to have or as aggressive as I would like.

Senator NUNN. What if we get a technical optimist heading that Red Team, too, and we basically come to the conclusion you are optimistic that you can do this and the other side is optimistic they can counter it? How do you ever make that judgment? When can you make that judgment? When will the policymakers, do you think, be able to make some definitive judgments on this?

The reason I ask about this is because, you see, the American people have, in my opinion, in many instances believed this High Frontier and SDI are the same thing. I know an awful lot of people have told me that and they believe we are right on the threshold of being able to achieve something like this in 5 or 6 years. I wonder at what stage the disillusionment is going to set in.

That is why I wanted you to address this. I think if I piece all of it together I may have an answer, but I am not sure that I have understood you. You are basically saying they have described accurately, reasonably accurately, in here one component of a comprehensive system?

General ABRAHAMSON. That is exactly right.

Senator NUNN. But they have not described other components which are essential and which are not yet developed?

General ABRAHAMSON. That is correct.

Senator NUNN. And we do not know about them yet?

General ABRAHAMSON. And some of those we are looking for simplified solutions to. We are really trying to be as imaginative as we can for some of these approaches, and that is one of the reasons in my point there I had some mature technology that we know about and understand.

But I believe if we are going to convince the Russians that we are not only capable of and resolved to be able to proceed with such a program that we have to have in every year's budget money so that they can see that we are not going to go part way and then stick our hands in our technology pocket and pull out an empty pocket, but that there is always something that is in the pot that is coming along a little better.

I am not saying make inappropriate levels of resources for that, but I think it is important that we have them so that they are convinced that we are going to go all the way. Unlike perhaps the Union of Concerned Scientists, they know we can do it; otherwise they would not be at Geneva today, in my judgment. Neither would they be so vociferous in terms of their response. Just like I know a great number of technical people believe that.

To come back to your initial question, we cannot just offer you opinion. We have to show you analysis that goes along with it. One of the reasons we are so well along at this point in time is that the Fletcher Commission did a fine job. They started with a series of technologies and they began to build up, and they built a technical roadmap and we started out on that technical roadmap.

What they were not able to do was to also start from the top and look at it from a system level and begin to come down. I recognize that as one of our key shortfalls, and this was not a criticism of the Fletcher Commission. It just was a matter of time and the resources to do that. So I have 10 teams that are doing that, 10 sepa-

rate teams that are there under this horse race procurement that are beginning to right now use models to examine where technology can go, how fast it can go, how it can be countered.

And these are teams of some of our best contractors out there. We are not investing very much, only $1 million in each one of these people, and they are on a procurement concept that we have never tried yet exactly this way in the Department of Defense, which says you run as fast as you can so that you can come up with the initial set of answers and oh, by the way, the ones who are good and come in with the good answers as fast as possible, we will let you go into the next phase so that you can begin to put together this system in a way that makes sense.

And, by the way, the ones who do not perform as well, we shoot them in midstride. We say you lose at that point.

Senator NUNN. Well, if you had to name your two or three biggest problems, what would they be? Would survivability of the system be at the top of the list or what would be at the top of the list?

SURVIVABILITY, COUNTERMEASURES, LETHALITY

General ABRAHAMSON. Yes, sir, only I have to describe it in two ways. Survivability, countermeasures, and lethality. These are really three phases of kind of the same phenomenon because, for example, where I am looking at in lethality now with lasers, I want to also show you before you leave, if you do have time, that this is real. You know, this is not theoretical now.

We are marching out now today and a lot of the good work that we have is based on work that did start with these teams even before all of this was put together, but it is paying off today. Survivability, lethality, and countermeasures are the hub of the whole problem.

It will always be a tough game here, and the Russians will be trying to countermeasure us.

Here is an example of some of the kind of testing that is going on. Here we are taking a small laboratory laser—xenon flouride is the kind of laser. We are irradiating a composite material, a composite material such as one might build an MX or an SS-19 out of.

Step one is to understand the phenomenology of that laser. Can you really cut through that thing? Once you burn through it, does the smoke stop the laser from being effective as one goes forward after that point in time?

The next step will be to say can they put some nifty things in that composite material so that it will be countermeasured and resistant to us! So that will be part of the program. Now that is very fundamental work that is going on today and going on effectively.

This is something I show to show people. It is a little more dramatic, but it is not very scientific. But it does show you some of the promise of what we are doing as well. This is a Thor tank. Remember under the ABM Treaty I cannot operate against full components. I cannot shoot against an ICBM, but I can take something that is old and is now only used as a space booster, take a component. This is a Thor oxygen tank that we have taken out at White Sands.

We pressurized this tank just like it was going to be used as a rocket going up. If it were accelerating up it would be getting some pressure down from the top, obviously the acceleration of gravity, so we did it in a kind of a crude way. You can see some cables that are putting weights on that particular system. We hit it with a very small laser there in the middle, trying to understand how it is that lasers destroy these things.

And in a very, very short period of time, on the order of a second, it crumpled the tank. The possibility is really there. And so we are beginning to understand those kinds of things as well. But that is part of our lethality and, eventually, our countermeasures program.

[The prepared statement of General Abrahamson follows:]

STATEMENT ON

THE STRATEGIC DEFENSE INITIATIVE

BY

LIEUTENANT GENERAL JAMES A. ABRAHAMSON
DIRECTOR, STRATEGIC DEFENSE INITIATIVE ORGANIZATION

BEFORE THE

COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE

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INTRODUCTION

Two years ago President Reagan expressed the conviction that free people should live secure in the knowledge that their security did not rest upon the threat of U.S. retaliation to deter a Soviet nuclear attack. At that time, he described the threat posed by increasing Soviet nuclear arsenals, and he proposed bold steps, embodied in a new initiative, to address that threat. This initiative calls for a comprehensive and intensive research effort to pursue recent advances in defense technology that have the potential for strengthening deterrence by introducing a defensive component to our deterrent posture.

The Strategic Defense Initiative (SDI) research program seeks to prove the potential for providing defensive alternatives to the current situation. As SDI research bears fruit, the U.S. may find ways to enhance deterrence and reduce instability. For example, a potential aggressor will be far less likely to mount an attack if he harbors grave uncertainties about the outcome of such an attack. In addition, reducing and eventually eliminating the military utility of ballistic missiles would be significant. If deployed in significant numbers, these offensive systems can permit an aggressor to reduce rapidly an opponent's ability to retaliate effectively. We can significantly improve overall stability and enhance deterrence if we can reduce the Soviet potential for conducting "first strikes".

Deterrence based on an increasing contribution of defense has the advantage of enabling the West to bring to bear its technological strength on defensive systems that emphasize nonnuclear solutions to nuclear problems. These systems offer the prospect of being far more compatible with the basic values and beliefs of our society. Finally, in the unlikely event deterrence should fail whether through irrationality or accident, defense offers the possibility of saving many lives. SDI is unique in that it offers the potential for protecting civilian assets as well as military resources. In an attack scenario, ranging from accidental launch to full-scale war, a future SDI system could save lives and cities as well as preserve the strength and retaliatory capability of the U.S.

The Strategic Defense Initiative is designed to answer a number of fundamental scientific and engineering questions that must be addressed before the promise of these new technologies can be fully assessed. It is a research program, not a program to deploy weapons. The question of whether to proceed with deployment of an actual ballistic missile defense system would arise in the years to come after the SDI research has generated the technology for effective defenses that are achievable and affordable.

Today I would like to describe for you the goals of the program and what is required to meet those goals; our approach to achieving the technical capability to support defensive options; the planned development pace; what our research and development program is designed to do and how it is structured; the current program status and plans for FY 1986; and the resources required.

PROGRAM GOALS

The goal of the Strategic Defense Initiative Organization is to conduct a vigorous program of research on emerging technologies in search of a better basis for a credible deterrence and to strengthen the stability of peace through strategic defense. We envision that such a pursuit will offer incentives to the Soviet Union to join with us to reduce significantly or even eliminate ballistic missile forces. The higher goal, of course, is increasing security of both nations, our allies, and the survival of humanity.

In achieving these goals the U.S. will continue its efforts to achieve meaningful and verifiable reductions in offensive nuclear forces. Soviet reaction to our initiative already demonstrates that they have taken seriously the impact of the emergence of these technologies on their own strategic plans. The Soviet Union has had a large SDI-equivalent program of its own for some years. They obviously appreciate the vast potential of the technologies and the bold objectives. It seems both prudent and necessary that first we fully understand the potential of such a defense and, second, that we use our best talents to bring these technologies along for what they may bring to the higher purposes of peace. The challenge to the

SDI is to provide viable defensive technology options that permit a future decision on whether or not to implement an effective defense against ballistic missiles.

DEVELOPING DEFENSIVE OPTIONS

As you know, the U.S. is taking steps necessary to underwrite stability in the near term via the President's strategic modernization program and our complementary arms reductions negotiations. Even as we do so, we must also consider the nature of stable deterrence in the future. For the past twenty years, we have based our concept of deterrence on the ability to threaten retaliation against any attack and impose costs on an aggressor that clearly outweigh any potential gains.

This basic idea also served as the foundation for the U.S. approach to the SALT process. At the time that process began, the U.S. concluded that offensive deterrence was not only sensible, but necessary, since we anticipated that neither side could develop the technology for a defensive system that could effectively deter the other side.

Today, however, the situation is different. New technologies offer the possibility of defenses that did not exist before. Of equal importance, the trends in the development of Soviet strategic forces, both offensive and defensive, as well as the problems of Soviet deception and non-compliance with existing agreements, will over the long term, increasingly call into question the fundamental assumptions upon which our current strategy is based.

Concerning offensive forces, the Soviet Union's relentless improvement of its ballistic missile forces has steadily eroded the fundamental survivability of our land-based retaliatory forces. And, concerning defensive forces, the Soviet Union has continued to pursue strategic advantage through the development of active and passive defenses with increased capability to counter surviving U.S. retaliatory forces.

These trends indicate that long-term U.S. dependence on offensive forces alone will likely lead to a steady erosion of stability and the effectiveness of deterrence. Should these trends be permitted to continue and the Soviet investment in both offensive and defensive capability proceed unrestrained and unanswered, the resultant condition will seriously undermine our ability to deter aggression against ourselves and our Allies. It is crucial, therefore, that the United States and the West as a whole keep options open in both the offensive and defensive area.

For that reason, on March 23, 1983, the President announced his decision to take an important first step by directing the establishment of a research program, the Strategic Defense Initiative, with the aim of exploring the potential of defense technologies to support a better basis for deterring aggression, strengthening strategic stability, increasing the security of the United States and our allies, and eventually eliminating the threat posed by ballistic missiles.

The SDI research program seeks to provide future decision-makers with technologies which could:

-- Improve significantly the stability in the nuclear balance;

-- Create a future environment that would serve the security interests of the Soviet Union as well as those of the U.S. and our Allies;

-- Enhance prospects for negotiated reductions in nuclear arsenals; and

-- Help improve the chances for survival of humanity.

The United States does not view defensive measures as a means of establishing military superiority. Because we have no ambitions in this regard, deployments of defensive systems would most usefully occur in the context of a cooperative, equitable, and verifiable arms control environment that regulates the offensive and defensive developments and deployments of the United States and Soviet Union. We are, of course, aware that when a shift is made to a different and enhanced basis for deterrence, careful consideration must be given to preserving a stable environment.

While SDI research is proceeding to identify defensive options, we are doing so with this in mind. At the same time, the U.S. Government is examining ways in which the offense/defense relationship can be managed to achieve a more stable balance that includes offensive arms reductions. We seek above all to ensure that the interaction of offensive and defensive forces removes the potential for destabilizing first strike options.

The SDI program directly responds to the ongoing and extensive Soviet anti-ballistic missile effort, which includes all the actual deployments permitted under the ABM Treaty. It provides a powerful deterrent to any Soviet decision to rapidly expand its ballistic missile defense capability beyond that permitted by the ABM Treaty. This, itself, is a critical task.

However, the overriding importance of SDI to the United States, our Allies, and the world in general is that it offers the possibility of radically altering the dangerous trends I mentioned earlier by moving to a better, more stable basis of deterrence, and by providing new and compelling incentives to the Soviet Union for seriously negotiating reductions in nuclear arsenals.

Therefore, as we look to the future, the U.S. objective is a radical reduction in the power of nuclear ballistic missiles, as well as the stabilization of the relationship between offensive and defensive nuclear arms, whether on earth or in space. If the promise of SDI is achieved, we will have the opportunity to enhance deterrence significantly by turning to a greater reliance on defensive systems--systems which do not threaten anyone.

ACHIEVING A TECHNICAL CAPABILITY

We see as our chief purpose the opportunity to offer a high confidence basis for decisions to pursue a defensive option. To do so, our research and technology program must do several things. It must conduct a broad-based research effort that expands and accelerates the progress of the relevant technologies. It must identify and evaluate the potential

effectiveness of candidate ballistic missile defenses that could be assembled and deployed from those technologies. It must show how those defense options can be operated and maintained to do the job.

Our current program does not harbor a preconceived notion of what an effective deployment would contain. It proceeds from an initial identification of promising technologies and related concepts molded into a defense architecture. It includes a wide range of such concepts with emphasis on nonnuclear technologies. It has, as yet, identified no single design or construct as the best or most appropriate.

To achieve our major goal, we must bring along the emerging technologies in a logical, timely way. The overall research task is expected to bring the technologies to maturity in three developmental thrusts. First, we need to validate the most mature technologies to provide the opportunity for our national leadership to decide whether to pursue initial defense options based on those technologies that are affordable, survivable, and effective. They could decide on an initial step which implements a defense against the threat we believe will be in place at least until early in the next century or they could decide to reserve the options as a simple hedge against Soviet breakout and development of a defense against U.S. ballistic missiles. Second, we need to ensure the long-term viability of future defensive options by demonstrating by the early 1990s, the feasibility and readiness of technologies to support the validation of more advanced defense options. And third, we need to conduct research that encourages the innovation of the U.S. scientific community in a response to the President's challenge to aid SDI research in identifying new approaches for eliminating the threat of ballistic missiles.

THE TECHNICAL DEVELOPMENT PACE

With these goals to guide the research program and the tasks to be performed, the SDI pace is being geared to allow decisions as early as the 1990s on whether to deploy advanced defensive options. A notional schedule for reseach and possible development and deployment would be comprised of four phases:

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-- A research phase, begun by the President in his 1983 initiative, would run into the early 1990s when decisions could be made by a future President and Congress on whether or not to enter into systems development. This research activity would be conducted within the constraints of our current treaty commitments.

-- The systems development or full-scale development phase could begin as early as the 1990s, assuming a decision is made to go ahead. During this period prototypes of actual defensive system components would be designed, built, and demonstrated.

-- A transition phase would be a period of incremental, sequential deployment of defensive systems. This phase could be designed so that each added increment would further enhance deterrence and reduce the risk of nuclear war.

-- The final phase would be a period of time during which deployment of highly effective multi-phased defensive systems would be completed and during which ballistic missile force levels would be brought to a negotiated nadir.

As a research program, SDI is focused on the first phase to bring defense options to the point where U.S. leaders, after consultation with our Allies, could make decisions on whether or not to proceed to the system development phase and subsequent deployment.

THE RESEARCH AND TECHNOLOGY PROGRAM

To provide the technological solutions needed, we are exploring all facets of a layered defense. Experience with strategic defenses has taught us that a layered defense offers the best chance of achieving the required effectiveness against a broad range of existing and potential future threats and attacks. In pursuing the technology for such defenses, we seek to:

-- Capitalize on the synergism derived from repeatedly engaging enemy ballistic missiles with a mixture of weapons, enabling the progressive layers to work together to mitigate any weaknesses of the individual elements.

-- Exacerbate the uncertainty of a potential attacker in his ability to succeed in his attack by presenting him with a complex defense suppression problem.

-- Deny damage from limited ballistic missile attacks and limit damage from full-scale attacks should deterrence fail.

In pursuing defense-in-depth options, a broad range of technologies must be developed in order to perform the five basic functions of any defense:

-- Detection of the threat and alerting the defense elements;

-- Acquisition and tracking of the threat to locate it in time and space;

-- Identification of the threat and discrimination against decoys to insure efficient allocation of the defense resources;

-- Interception and destruction of the threat; and

-- Assessment of the results of the engagement.

These five functions are performed repeatedly in the separate engagements of the ballistic missiles in their four phases of flight (boost, post-boost, midcourse, and terminal).

To focus our efforts we have grouped our activities into five program elements. These elements are designed to (1) advance the technology base, (2) conduct experimental demonstrations that validate the technology, and (3) conduct concept and development definition efforts which focus the overall technology development on those critical issues that must be resolved to establish feasibility.

The Sensors Program includes a mixture of some of the most and least mature technologies being developed by the SDIO. It includes technology base efforts to support surveillance, acquisition, tracking, and kill assessment that provide data on the observables from ballistic missiles and their warheads; new radar and optical sensors capable of obtaining detailed imagery of warheads and warhead deployment; and on-board signal and data

processing capable of performing necessary computations right at the sensor. The experiments include three general classes: boost-phase surveillance, midcourse tracking, and terminal-phase tracking and discrimination. Space-based surveillance experiments are planned for the early 1990s to demonstrate survivable means of detecting and tracking boosters from very high altitudes in space. Other space-based sensor experiments are to be conducted in the same timeframe to explore our ability to track tens of thousands of objects during midcourse. Such platforms may ultimately include active sensors to aid in discrimination. An airborne sensor experiment will determine whether forward-based aircraft can perform as an adjunct to ground-based radars to aid in target discrimination. A terminal imaging radar experiment is planned to demonstrate rapidly evolving ground-based radar capabilities.

The Directed Energy Weapons (DEW) technology program is advancing the state-of-the-art in the technologies for (1) high powered beam generation; (2) optics and sensors for correcting and controlling the high powered beam; (3) large, lightweight mirrors and lightweight magnets for focusing the beam on the target; (4) precision acquisition, tracking, and pointing to put and hold the beam on target; and (5) fire control to capitalize on those unique features of directed energy weapons such as the ability to measure and control the energy delivered to the target. The DEW technology program includes major experiments at the subsystem level in the four concepts currently being examined: space-based lasers, ground-based lasers, space-based particle beams, and nuclear driven directed energy. These concepts are candidates for boost and post-boost phase intercept and for discrimination functions in the other phases. In addition, selected subsystems for these concepts will be integrated in on-the-ground experiments designed to test interface approaches and resolve technical issues arising from the integration. The work on nuclear-driven directed energy is largely pursued by the Department of Energy and is designed to establish its technical feasibility. Equally important, the work ensures that the U.S. understands the potential impact of these emerging concepts on future military capabilities.

The Kinetic Energy Weapons (KEW) technology program contains some of the most mature technology, and its efforts include interceptors and hypervelocity gun systems for midcourse intercept, terminal intercept, defense of space platforms, and boost phase intercept. Technology base efforts include developments needed for fire control, guidance and control, warheads and fuzing for guided projectiles, hypervelocity launchers, and high performance interceptors. The program calls for hardware demonstrations of kinetic energy weapon systems capabilities.

The Lethality, Survivability, and Key Technologies Program provides critical supporting R&D. Understanding the vulnerability of ballistic missiles to the various kill mechanisms is fundamental to assessing their effectiveness against current and responsively hardened targets. Survivability to mission completion, particularly of any defense space assets, is fundamental if defensive options are to be viable. Economical space transportation, on-orbit logistics and maintenance, kilowatt/megawatt sources of power, and multi-megajoule energy storage and conversion are potentially key needs in an affordable defense deployment. Lethality and target hardening efforts will provide the basic theory underlying kill mechanism/-target interactions, the resulting damage and response of the target to damage, and fundamental limitations in hardening countermeasures.

The survivability problem includes substantial technology development, particularly in the case of space-based components. It also includes identification and assessment of innovative survivability hardware and tactics and evaluations of the survivability of conceptual designs. Space transportation, logistics, and space power efforts are designed to take advantage of existing DoD and NASA definition efforts and to expand them into the definition phase and satisfaction of the more demanding requirements of a defense-in-depth.

The Systems Concepts and Battle Management Technology Program is designed to allow intelligent choices among competing approaches to defense architectures and tc develop the technologies necessary to allow eventual

implementation of a highly responsive, ultra reliable, survivable, enduring and cost-effective battle management/command, control, and communication (C^3) system. We will perform threat analyses, mission analyses, conceptual design of defensive architectures and performance requirements definition, and system evaluation for all levels of a layered ballistic missile defense. The battle management/C^3 efforts will provide the tools, methods, and components (1) for development and eventual implementation of the system and (2) to quantify risk and cost of achieving such a system.

STATUS AND PROGRESS

As you may recall, the President directed the creation of the Strategic Defense Initiative Organization to be placed directly under the Secretary of Defense. We were purposely organized for centralized planning and direction with decentralized execution through the Services and Defense agencies of the DoD and in cooperation with other departments and organizations of the Government. We had established an initial program with intermediate goals and a pace that would allow us to reach our main objectives. Reductions in FY 1985, however, have necessitated postponement of some new starts and enhancements to existing programs.

Many of these ongoing activities are already showing substantial progress. For example, last June, the Army Homing Overlay Experiment demonstrated the capability of a nonnuclear missile to intercept and destroy an incoming warhead outside the earth's atmosphere. Directed energy research devices are already operating at several laboratories. These include a neutral partical beam device at Los Alamos, free electron lasers at Los Alamos, Livermore, and contractor facilities, and chemical and excimer laser devices at contractor facilities. A very high power chemical laser has been installed at White Sands Missile Range. It will be used later this year for lethality and vulnerability experiments. Additionally, progress is exceeding expectations in many areas, including railgun technologies as well as sensors and cryogenic refrigeration devices.

As we now complete our initial year we have assimilated existing programs, organized them into groupings of major efforts, and organized the

start of some new activities. Our FY 1986 program will complete this beginning process. We are requesting $3.722 B for expenditures in five program elements consisting of some 73 tasks. I will only cite a few examples that characterize our planned FY 1986 activities. The details of what we plan are in classified summaries provided to Congress, and we are prepared to discuss these details in classified testimony or briefings to you and your staff.

In Surveillance Acquisition and Tracking we will:

-- Begin to bring on-line new capabilities for signature and background collection;

-- Initiate important new technology efforts in optics and radar imaging;

-- Complete the initial concept definition of several major surveillance demonstrations; and

-- Continue the development of advanced architectures for high speed signal processing.

In Directed Energy Weapons Technology we will:

-- Complete initial concept definition of a space-based laser and begin to define required demonstrations to validate that technology; continue selected elements of the TRIAD technology program including fabrication of a large hydrogen fluoride (HF) chemical laser (ALPHA), beam control experiment (LODE), and a large lightweight mirror (LAMP); continue the definition of space laser integration experiments; and continue the identification of feasible and promising approaches for advanced space-based laser concepts and components.

-- Complete key experimentation of the feasibility of critical components in ground-based laser technology; continue experiments to support high brightness, high power short wavelength, excimer and free electron lasers; and continue basic technology development for beam control and propagation from ground transmitters as well as development of space relay mirror technology.

-- Establish neutral particle beam concepts feasibility through experiments using the Accelerator Test Stand and continue theoretical and laboratory experiments designed to prove technologies for beam generation, control, pointing, and propagation, along with exploration of new concepts for charged particle beams.

The Kinetic Energy Weapons technology program will:

-- Complete initial investigations of the key technologies for the homing payload of an endoatmospheric terminal interceptor and initiate brassboard demonstrations;

-- Continue validation of component technologies for exoatmospheric nonnuclear kill interceptors;

-- Select hypervelocity launcher technology baselines and complete initial concept design;

-- Complete in FY 1986 the initial design and assessment of the requirements on technology for an exoatmospheric reentry vehicle interceptor; define and formally approve a fundamental configuration; and

-- Investigate through experimentation the feasibility of integrating guided, high-g tolerant, hit-to-kill munitions in FY 1986.

In Battle Management during this current year we are establishing baseline requirements and candidate configurations for fault-tolerant computation concepts; developing software methods and tools; developing methods for weapons release and protection against malfunctions; and generating the vast number of algorithms that will be required for a multi-layered, large-scale battle management capability. Our efforts in FY 1986 will continue these investigations.

In Systems Analyses our activities are focused on the development of architectures, models, and simulations so that we can determine performance and evaluate effectiveness of the SDI technologies in all phases. In FY 1986 we will begin to evaluate technologies and designs and start detailed

analyses of major issues and architectures. Our new Battle Management/C^3 Development Evaluation Facility will support this effort, when completed.

In Survivability, experts are already involved in supporting the architecture and research activities associated with SDI. In FY 1986 they will increase their activity in surveying and assessing ongoing work. To develop the whole technology base, projects in passive and active countermeasures work will expand appreciably as candidate concepts are selected for design which could be tested in the coming years. Contracts will also be initiated to stimulate innovative ideas for enhancing survivability.

In Lethality and Target Hardening, experts are bringing their various projects into line so that comparable results will be available on the relative vulnerabilities resulting from the kinds of kill mechanisms we are investigating. In FY 1986 we will be validating effects models, bringing facilities up to capabilities to test, and performing experiments of specific kill mechanisms on specific materials and structures in specific environments.

In the Nuclear Power task, the multi-organization activity investigating the SP-100 nuclear power subsystem will shift to selection and awarding of a contract to do detailed design work for test articles. The multi-megawatt project will concentrate on a final feasibility decision and the awarding of follow-on studies for approximately six concepts.

In Space Logistics, our efforts investigating logistics will concentrate on the completion of the studies on both immediate and longer term goals for promising technology pursuits and a reasonable investment strategy; such as how to reduce significantly launch costs.

RESOURCE REQUIREMENTS

The ongoing activities and resources that the Strategic Defense Initiative received at its inception consisted of many service and agency programs, plus resources for investing in new starts and for tailoring the existing programs to SDI needs. One ongoing effort was the Army Ballistic Missile Defense program. A second effort involved improved missile launch

detection programs for warning of nuclear attack. The majority of the resources previously planned for this first group of programs were, in fact, applied by the SDIO to that group. Intensive planning and evaluation activities over an 18-month period from March 1983 by independent study groups and the SDIO staff, supported by DoD Services and Agencies, NASA, and DoE, resulted in plans to invest additional resources to refocus and enhance these existing programs and begin needed new ones. Such planning activities will continue for at least the remainder of FY 1985.

We estimate that the SDI will cost about $26 billion between fiscal years 1985 and 1989. This amount represents less than 2% of the defense budget, and less than 15% of the Defense research budget for this period, and is less than is proposed for strategic offensive research and development. The Department of Defense and Department of Energy had planned to request between $15 - 18 billion during this period for related research activities, even without a new focus on ballistic missile defense. Indeed, many of the new technologies, such as sensors, were already recognized to have great potential for a wide range of defense missions.

In the SDIO proposed budget, the largest single item is the sensors program, which represents almost 40% of the total program. Work in weapons-related areas is about evenly divided between directed energy and kinetic energy weapons. It is particularly important to note that about 5% of the SDIO budget has been reserved for innovative science and technology programs.

SDIO BUDGET SUMMARY

SDIO PROGRAM	FY 85 APPROPRIATION	FY 86 REQUEST
Sensors	$ 546 Million	$1386 Million
Directed Energy	$ 376	$ 966
Kinetic Energy	$ 256	$ 860
System Analysis & Battle Management	$ 99	$ 243
Survivability, Lethality, Space Power & Logistics	$ 112	$ 258
Management	$ 11	$ 9
Total	$1400 Million	$3722 Million

CONCLUDING OBSERVATIONS

-- If one had collected newspaper and periodical coverage over the two years since the President's call for a defense initiative, one could have easily assembled nearly a yard high stack of material on what the press has become fond of calling "Star Wars".

-- As one whose job is, in part, to ensure that the nation understands our Initiative, reading that material is a frequent reminder of one's failures to communicate.

-- I suppose those failures to communicate are hardest to take when reports suggest that we are developing systems to deploy in the near term that may not

- Contribute to our security, or
- Be effective, affordable, or survivable

and may, in turn,

- Be destabilizing, and
- Violate arms control agreements

and half a dozen similar negative arguments.

-- But I also see an encouraging trend away from the hard-line and frequently simplistic postures taken in the early public discussions.

-- The trend I see is away from posturing toward hard-nosed debate between individuals with honestly held convictions on these critical issues.

-- The trend is away from "it will or it won't" toward creating the best definition of the achievements needed before the nation could make a decision to proceed with confidence down this new path.

-- And that is my primary job--to provide the technical achievement that can give substance to this very important debate.

-- Which brings to mind a second important trend; we have gotten better at articulating what the program is and presumably the press is getting better at listening to what we are saying.

-- Incidentally, I measure this trend by how often I see the phrase "so-called Star Wars" in print and how few times someone discovers a long articulated facet of the program and describes it as a "change in direction".

-- The key points that correctly describe the SDI to the nation are appearing more frequently.

-- For example:

- We are conducting a research and technology program; there has been no decision to deploy defenses. A decision on whether to develop and deploy an effective defense cannot be made until the Initiative yields the necessary technical options and the technologies to support such a decision.
- The program is pursuing more than exotic beam weapons based in space designed to "zap" ballistic missiles as they rise from the earth; its success depends on demonstrating the technical feasibility of ground, air, and space-based concepts for a layered defense that can be assembled in various architectures to enhance deterence, increase stability and ensure our security and that of our Allies while moving us away from our current dependence on the threat of prompt nuclear retaliation.
- These options may or may not contain defense weapons based in space. But if they do, they will threaten attacking missiles and not threaten people on earth.

-- I hope my testimony today can advance this dialogue and understanding of what the SDI is about.

-- I am excited by the challenge and the responsibility for bringing this much needed Initiative to fruition.

-- In accomplishing this goal we will have pushed the level of technical achievement across a spectrum of technologies that are broadly applicable to defense needs.

-- We will have resolved many outstanding issues about the future role and impact of such emerging technologies as directed energy.

-- And, of course, we will give a future President, Congress, and our Allies the necessary ingredients for taking the first step on the road to eliminating the destabilizing threat of ballistic missiles.

-- I am pleased that I have had and will have the opportunity to work with you and your staffs, so that together we may ensure that the nation and our allies understand what we are doing, why we are doing it, and how we plan to evaluate whether we have succeeded. I am also looking forward to engaging in that challenging dialogue between opponents and advocates that will ultimately define that criteria for success. And finally, I am resolute in opposing the preconceived solution, the ill-conceived criticism, or the notion that we are preordained to failure in this enterprise.

-- Thank you for this opportunity to present our research program.

Senator WARNER. I have been handed a note. Due to the pending criticality of the agricultural issues on the floor, the ranking minority member, Senator Exon, has not been able to attend this hearing. We had earlier, as you know, together planned the timing and the date for this hearing. Recognizing the importance of agriculture to his constituency, he was compelled to continue to work with the leadership, and I hope that perhaps after he has had an opportunity to look at this record you would avail yourself to work with him to the extent he needs any further orientation.

General ABRAHAMSON. Fine.

ARMS CONTROL ISSUES

Senator WARNER. I am still concerned about the clarity in the record, Dr. Ikle, of your interpretation of the President's statements, together with those of the Secretaries of State and Defense, with respect to the forthcoming discussions with the Soviet Union on a wide range of arms control issues, again, the extent to which this program will be a part of those discussions.

Now I am unfortunately unable to locate a quote that I had—here it is. This is Gromyko speaking on January 18. The Foreign Minister maintained that there was an interrelationship between strategic nuclear weapons and space arms. He said that the Soviet Union would be ready to drastically cut back its strategic missiles if the United States would negotiate restrictions on space arms.

However, he cautioned, if no progress has been made on the space issue the talks would blow up. He made such a warning to the U.S. delegate. Gromyko repeatedly criticized the U.S. strategic defense initiative, arguing that, "there is nothing defensive about it. One should say openly that these weapons are offensive and that this plan as a whole, frankly speaking, is a plan of aggression. We are resolutely against it."

Now once against that background, Mr. Ikle, would you clarify what it is that you understand to be the position of the administration as we enter these talks?

Mr. IKLE. To discuss in that part of the talks that you are referring to, not the START and INF, to discuss in that part——

Senator WARNER. You are using purposely the word "discuss" as not "negotiate"?

Mr. IKLE. To deal in that part of the negotiation with the relationship of offensive and defensive systems and the strategic future that we both should be moving to, and a way to set the guidelines for the other negotiations where we seek reductions in offensive arms, and to discuss and negotiate about possible instabilities that would result from space activities and transition to reduced offensive arms.

Senator WARNER. Of course, we both recognize that these talks are likely to be prolonged, and I do not think—would it be fair to say that we should not at this time preclude the option of this administration of considering some negotiations—and I use that word purposely—on the issue of the timing of certain testing events or a possible deployment of one or more elements of this system, if that is possible, General. I do not know if it can be partially deployed somehow.

In other words, we cannot foreclose today that in years hence that might be an option to be considered.

Mr. IKLE. I think issues like this would fit well into the question of interim stability for the intervening years, where of course we also have to be concerned as to what happens on the Soviet short-term ABM capability, given the Soviet violations, another issue that we want to discuss or negotiate about.

Senator WARNER. But we are not, as we proceed to go into these discussions, foreclosing the option at some point in time in the future maybe of negotiating certain aspects of testing, of deployment as it relates to the ABM Treaty?

Mr. IKLE. Well, it would not be a good idea here on the record to speculate about detailed aspects of negotiations that are before us.

Senator WARNER. But we are in a sense in certain respects. One interpretation is that there will be no negotiations now or forever more.

Mr. IKLE. That was more for the long-term future in an answer to Senator Levin, and I realize the gist of that exchange, and that he was referring to a particular answer in a press conference by the President, and it is never a good idea in a setting like this to try to reinterpret it or to interpret what the President has said.

I think your suggestion there of pulling together the record of what has been stated by the President and Cabinet members on that issue is an excellent one and to put that in the record.

Senator WARNER. Well, I certainly would not want this hearing to terminate on the note that the administration testified that now and forever more we are closing the door to possible negotiation of certain aspects of this program which will have a direct impact at some future date and time on the ABM Treaty.

Mr. IKLE. Speaking just for myself, it clearly follows from the idea that we should want to keep the transition to the future as stable as possible and as easy as possible for both us and the Soviet Union that we would be negotiating about these things.

Senator WARNER. Now, General, this program over which you have jurisdiction, as I understand it, is limited to the conventional type of interdiction; is that correct?

General ABRAHAMSON. I am not sure that I understand exactly your question, sir.

Senator WARNER. In the budget there are requests for research and development funds which bear on nuclear systems that could be employed for the interdiction of ballistic missiles.

General ABRAHAMSON. Oh, I see.

Senator WARNER. Now that is in the Department of Energy budget.

General ABRAHAMSON. Yes, sir. There is a portion of the research and technology effort from the Department of Energy that is aimed at looking at nuclear types of systems. Now I think that is in fact important to put in perspective because clearly our emphasis on developing something for deployment is nonnuclear. That would be the clear preference and that is my direction.

Senator WARNER. We have got to get our pronouns and programs very clear. Let us talk about first your program. At this point in time, the funds you are requesting under that do not relate to nuclear systems.

General ABRAHAMSON. That is correct.

Senator WARNER. That is correct. And your entire organization is directed toward conventional means of interdiction?

General ABRAHAMSON. That is correct. However, I must point out that we do——

Senator WARNER. I just want to make sure, because over here DOE is looking at other systems and I want to clarify the interrelationship between your program——

General ABRAHAMSON. We do have coordination.

Senator WARNER. I beg your pardon?

General ABRAHAMSON. We do use coordination between our efforts in the Department of Defense and the efforts in the Department of Energy to examine some of the nuclear approaches to these systems. In fact, we have created a steering committee so that we can at least coordinate and ensure that we do understand some of these particular things.

Let me give you an example why. Even though clearly our emphasis here is to build a nonnuclear intercept kind of capability for the future for operation here, we must understand what the potential of a nuclear-driven kind of concept is. Let me just use one example.

In the Department of Energy budget there is effort that is being expended for underground nuclear tests for what is called an x-ray laser. Now the x-ray portion of the laser, it is called a laser. The laser is what destroys the missiles themselves. However, an efficient way of generating that laser is to use a very small nuclear bomb.

Senator WARNER. The energy source.

General ABRAHAMSON. So it is an energy source in that case. Now it is important for us to understand that from two viewpoints. The first and foremost viewpoint is that just as we understand that system as a possibility, the Soviets may understand that as a possibility as well, and this goes back to our emphasis and our concern with countermeasures.

If that turns out to be a very, very formidable weapon, one that could be powerful enough to have a very significant effect on any architecture or any set of systems that we put up, it is imperative that we understand the extent of that, just how practical that is, and what the limits are that they might want to build into that.

So for that reason alone one would want the Department of Energy to proceed with that kind of testing.

Senator WARNER. I am not seeking a justification for what they are doing, but I want to make it clear that this program is advertised as being nonnuclear.

General ABRAHAMSON. Yes, sir.

Senator WARNER. But you are keeping abreast of the nuclear developments.

General ABRAHAMSON. That is correct.

Senator WARNER. And I suspect that we should say at this point in time it may well be when this system is integrated it might contain one or more components that could be predicated on a source of energy from nuclear or fission.

General ABRAHAMSON. That is a possibility, obviously. As we test it and examine it and understand what it is in terms of a threat, it

might turn out to be very, very practical as something useful on our side as well. However, again I would point out that my emphasis is to be able to try to create a nonnuclear system that would work.

Senator WARNER. Dr. Ikle, in order for the SDI to be effective, must we assume that the Soviets share our goals of stability and a secure peace?

Mr. IKLE. In order for us to have arms reductions and stability in forces, we need that kind of a convergence, and, as I stated at the outset, that kind of a convergence to me seems far more likely when we both have primarily defensive systems than if we both have primarily offensive systems, because it is the Soviet reaction to our offensive systems, their attempt to have counterforce and countermeasures, that has been driving the Soviet buildup.

Senator WARNER. Senator Nunn?

TRANSITION TO STRATEGIC DEFENSE

Senator NUNN. Just a couple of questions. Dr. Ikle, you have talked about the transition period in going to strategic defense and you say in your statement, and let me quote you:

> On the contrary, the initial phases of a missile defense would enhance the stability of our present deterrent forces. As a growing fraction of the Soviet missiles could no longer reach their target, Soviet planners would face increasing uncertainties and difficulties in designing a rational first strike.

Could you tell us what you mean by "rational first strike"?

Mr. IKLE. One that can accomplish a military purpose for the Soviet planners in disabling our military forces, particularly our forces that could do great damage to the Soviet military capability, where they can in essence win in a war.

Senator NUNN. Well, don't you believe that the Soviet reaction to U.S. defensive deployments, or moving in the direction that would give them reason to believe we are going to go to deployments, would lead them to increase their offensive forces?

Mr. IKLE. Their offensive missile forces?

Senator NUNN. Yes.

Mr. IKLE. Not necessarily. If the effectiveness is such that it would cost them considerably more than it would cost us to keep the defenses effective and cost them more to overcome them, they might do what they did in the case of the bomber defenses, where Khrushchev said it is too difficult to get through these bomber defenses. Let us get out of the bomber business.

Senator NUNN. They are not out of the bomber business.

Mr. IKLE. Now they are back in it because we are providing a freeway for their bombers. We have no air defense. Once we closed the freeway, they got out of it.

AIR DEFENSE SYSTEM

Senator NUNN. Well, that leads to the next question. Are we working on an air defense system to complement this in terms of an SDI deployment if we decide to deploy SDI, are we going to have a comprehensive air defense system, too?

Mr. IKLE. Not in a major way because, in our view, first things first is to get defenses to counter the far more destabilizing ballistic

missile threat. If then one would want to go on and do something about the air-breathing threat, that could follow.

Senator NUNN. When you say "destabilizing missile threat," you are really talking about a missile threat that would hit our hard targets, are you not?

Mr. IKLE. No, the destabilizing aspect of the missile threat is the speed of ballistic missiles, the same reason that prompted us and previous administrations to put particular emphasis in SALT and START talks on reducing ballistic missiles as distinct from bombers.

Senator NUNN. Well, you are again talking, though, about not protecting population. You are protecting and talking about the threat——

Mr. IKLE. Yes; the targets, presumably, of the Soviet missiles would be our missiles and our military capability. And another destabilizing——

Senator NUNN. Well, we are really not planning a population type defense then, are we, if we are not going to have an air defense against bombers?

Mr. IKLE. If you do not have an air defense against bombers——

Senator NUNN. How will the population be protected? How would they be protected against bombers?

Mr. IKLE. You would need a bomber defense.

Senator NUNN. Well, that gets back to the first question. Why are we not planning a bomber defense?

Mr. IKLE. The time phasing is such that it would be premature. The first thing is to see what you can do on ballistic missile defense. General Abrahamson may elaborate on this point.

COST-EFFECTIVE MISSILE DEFENSE

Senator NUNN. But if you decide you are going to have a feasible, cost-effective missile defense, then will it not follow that you then, to achieve your overall purpose, will have to have a bomber defense, too?

Mr. IKLE. Unless you can reduce and eliminate the bomber threat through arms reduction agreements, you probably would want at that time an air defense.

Senator NUNN. We have worked on air defenses before. What would be the cost of a comprehensive air defense?

Mr. IKLE. I think it is too early to give a cost figure on that, but I think General Abrahamson wanted to make a point here on the connection of SDI and air defense.

Senator NUNN. Well, I thought we knew an awful lot about air defense now. I did not think it would be too early to have some idea of that.

General ABRAHAMSON. Well, I think the key is if you want to try to cost out, extrapolating from our present concepts of air defense, or if you wish to try to really see if some of the kinds of technologies that may enable us to produce a cost-effective defense against ballistic missiles, if any of these things can also offer us extrapolation and be potentially an effective——

Senator NUNN. So you are working on that?

General ABRAHAMSON. Well, I need to be accurate about that, sir, and I think that goes back to what he said. We are not ignoring the question of air defenses. There are studies that are going on. There was one that was proceeding saying the bomber threat is really the air-breathing threat, both cruise missiles and bombers, and it was called SDA–2000.

And it was an initial study. It is an initial step, just like the Fletcher Commission was an initial step, and the Hoffman study was an initial step, looking at the question of ballistic missile defense. Recall that the reason we gave up bomber defense in this country was because it was quite clear that we could not defend against ballistic missiles and, frankly, by the time that the bombers got here there would not be anything left to defend anyhow, because the ballistic missiles would have destroyed our entire capability.

Therefore, it does seem logical to first examine and arrive at a point where we have reasonable confidence that we can go ahead with a strategic defense against ballistic missiles, again the most timely and the most dangerous ones.

Senator NUNN. On that logic, would it not also be logical to put most of our research on the boost phase part of this effort, determining whether that would work, and then if that does work all sorts of things flow from it? But if that does not work, the intermediate stages and the terminal phases in terms of a comprehensive defense would not be feasible, would they? Is that the way you are proceeding?

General ABRAHAMSON. We are proceeding, trying to ensure that we can get the maximum leverage out of an entire system, and that it does include a primary emphasis on the boost phase, but it does not mean that if for some reason we would lose the boost phase that you would give up. But we certainly would not collapse down to only a terminal defense.

One of the very important reasons——

Senator NUNN. But if we do not get the boost phase, the other parts of it are moot as far as a comprehensive defense, as opposed to defending missile fields, is that not so?

General ABRAHAMSON. Well, let us say that for some reason you just flat could not get a booster and that maybe they were going to build a faster burn booster, which is one of the kinds of responsive things that they might be able to do, and that might become in fact quite difficult then to be able to knock out those boosters in the very short time that one would have.

But there still is a postboost phase. There still is an extended time in orbit and if you have effective weapons that can be more effective in those phases and make up for what you have lost in the first phase, then that is important. These are again part of our tradeoffs and why we are not rushing to you with the first answer right off the bat.

The principal thrust——

Senator NUNN. You do not have any contingency under which you would be able to provide a comprehensive strategic defense in the absence of the boost phase capability, do you? I mean, there is no research being done that would even come close to giving us an

intermediate and terminal defense capability that would be comprehensive in nature, without a boost phase up front, is there?

General ABRAHAMSON. We are looking at system studies that would assume or could assume some very low effectiveness levels in a boost phase, and then asking the question what would be left and could we still have a comprehensive system. Now the thrust of your question and the thrust of your statement is correct, in fact.

We are putting just as much emphasis as we can on the boost phase, but do not define that narrowly as only the time that in fact the booster is operating. We are talking about a time that allows you with the booster to see it well enough so that you can get an initial vector, and if it burns out and you get it 10 seconds after it burns out that really does not hurt too bad.

Senator NUNN. Let me just ask a couple more questions, Mr. Chairman, and that would be it.

SURVIVABLE DEFENSIVE SYSTEMS ESSENTIAL

Would you agree with this statement, General? "The technologies must produce defensive systems that are survivable; if not, the defenses would themselves be tempting targets for a first strike and this would decrease rather than enhance the ability."

General ABRAHAMSON. Yes, sir, I would.

Senator NUNN. So that is a crucial factor that we have to judge.

Mr. IKLE. Let me perhaps add a point there. That also obtains for our current deterrent offensive forces and they are survivable up to a degree, yet we do of course rely on them. There is nothing absolute there on survivability. And our submarines, our bombers, our missiles, you could say the same thing about those.

Senator NUNN. So you would not completely agree with that?

Mr. IKLE. No. I am only adding that you have to keep in mind there is a matter of degree, a matter of judgment involved there.

Senator NUNN. Well, let me repeat it and see if you—would you say that you did or did not agree with the fact that the technologies must produce survivable systems. If not, the defenses would themselves be tempting targets and that would decrease rather than enhance stability.

Mr. IKLE. I agree, with the qualification that survivability may not be absolute, much as it is not absolute for our present deterrent force. There is always a risk of some of these things being attacked successfully.

Senator NUNN. Do we then have a standard that is subjective here? What degree of survivability?

Mr. IKLE. No more subjective than with our current systems.

General ABRAHAMSON. Sir, that is why the analysis.

Senator NUNN. Well, in our current systems we are striving mightily to have them survivable, so I am just wondering what are you judging this survivability by.

General ABRAHAMSON. Nothing is perfectly survivable and in fact the point is that that is why these systems studies are so important and in fact I wish we had them all available to us. We do not yet. And some of the initial studies will not be complete yet until about the summer timeframe.

Senator NUNN. Well, I remember going through this same thing on the MX. It all started out as having to be survivable. If not, it was going to be destabilizing. We have worked it around now where it is not survivable, but it is no longer destabilizing, and that has not been by anything physical or tangible but simply by subjective arguments.

General ABRAHAMSON. Sir, I do not want to fall in an MX hole.

Senator NUNN. I just wonder if we are going to go through that here, because this statement is pretty strong, and I happen to agree with it. But Dr. Ikle opened up a hedge here that is going to be very difficult to establish anything to judge what survivable is, and that seems to me to be a critical element.

General ABRAHAMSON. That is indeed the system studies and the way you produce these countermeasures.

Now the question is what is survivable in that event, and if you are saying that—some people would like to be able to say that a satellite cannot survive, for example. Clearly a single satellite cannot survive. And then we go through one of these arguments that have been introduced by the Union of Concerned Scientists which I frankly consider to be very simplistic and do not go into the whole equation as one looks at it.

But if enough of the system survives so that in fact you can conduct its mission, then you do have a survivable system. It is just like every F-16 that starts out in a raid, just as great as the F-16 was and is—and, by the way, I am not entirely objective about that—it is a survivable system if you can get through and meet that objective and get back with most of the crews.

And that is exactly what we are talking about here, and I think that is the point Dr. Ikle is trying to make.

Senator NUNN. This statement was not by the Union of Concerned Scientists. This is a statement by Paul Nitze.

General ABRAHAMSON. Yes, sir, and that is correct, and I agreed with you, sir.

Senator NUNN. I agree, and I think we all understand the word survivable does not mean 100 percent, but it means substantial, and we have not preserved that definition very well in our offensive forces.

Now one other statement from here. This is also from Paul Nitze.

> The new defensive systems must also be cost-effective at the margin; that is, it must be cheap enough to add additional defensive capabilities so that the other side has no incentive to add additional offensive capability to overcome the defense.
>
> If this criterion is not met, the defensive systems could encourage a proliferation of countermeasures and additional offensive weapons to overcome deployed defenses instead of a redirection of effort from offense to defense.

General ABRAHAMSON. That is what I call the fundamental cost inequality that we have to be able to demonstrate. By the way, that is a fairly easy statement to say, and a rather difficult question to deal with. I am not trying to be uneasy and move around here so that I become a hard target for you to get at, I am really not.

We in fact have been struggling with that question. How do you determine how valuable an offensive missile is to a Soviet planner? How much does it cost him? And how can you make that kind of

an exchange? That problem is not an easy one either, but we are tackling it and we are trying to be able to get insight into it.

Senator WARNER. Let me ask a question on that. Would the Senator yield?

This is to both witnesses, because this is very important. Senator Cohen before you arrived, Senator Nunn, raised this issue. I was going to follow on in the record, but I think it is important to do it now.

COST ADVANTAGE OF DEFENSE OVER OFFENSE

Have you got any analysis that would back up the conclusion that the cost advantage is in favor of defense over offense?

General ABRAHAMSON. I do not yet have a total analysis that does begin to show that. However, we are beginning to get out of some of our systems studies, particularly our pilot architecture studies, some very interesting kinds of conclusions and I believe that at least commenting on one of those is quite important because I am afraid that you may walk away with some wrong impressions.

The concept of a layered defense is really very, very critical and this goes to underscore the need, sir, for a boost phase system, but in addition to that other layers that begin to operate through it or with it and in conjunction with it, because then what you are doing is presenting a Soviet planner with not a simple probability kind of a problem that he would presently have.

If we had, for example, our system like we did up in North Dakota now, if we just had a thin umbrella over a Minuteman field of some particular kind, he could, just by adding one, two, or three warheads, a small number, assure himself in that kind of a terminal system located just exactly at that one point that he could bust through.

On the other hand, if he is faced with a set of probabilities, the probability that he could get 30 percent of his systems through a boost phase but he did not know which 30, and then he could get only another 30 percent through of what remained, through a post-boost phase, but again he does not know what 30, and then you get up to a midcourse phase, and only 30 percent of what is left can get through, he really only has a very small number that can get through.

But the thing that becomes startling and turns the equation in favor of the defense in a dramatic, dramatic way is what happens to his assurance that he is going to be able to get through with the one that he is aiming at the command and control center in Washington or is aimed at New York City, or is aimed at London, and our initial calculations show that we are not talking about one, two, or three or four missiles when we are dealing with confidence levels that he wants to get as a conservative military planner; we are talking about multiplication factors of hundreds of warheads that he has to then begin to deal with.

And that is a very fundamental part of the cost inequality.

Senator NUNN. Well, I think that has great attractiveness as far as protecting hardened missile fields, but when you talk about New York City and London, I suspect he would have long since started

carrying bombs in in suitcases and putting them into basements, and there is not anything in your program that is going to handle that.

We cannot stop marijuana bales from coming in. They could smuggle the bombs in in marijuana bales, I suppose. [Laughter.]

I mean that is why when you start throwing out this business of protecting cities you lose me. I just do not see how you comprehensively protect cities—and it would not be one bomb on New York City. If they really thought you had that kind of defense, they would probably put 15 or 20 suitcase bombs in cities, if they really wanted to hit New York City.

Let me go ahead. We will not solve that.

Senator WARNER. I think in fairness let us give the two witnesses a chance, because that is a story that is working its way around and as the general public tries to comprehend this program, maybe there is an answer, Senator Nunn.

Senator NUNN. I also throw out the example of cruise missiles from a submarine. I mean, is your program comprehensive enough to stop the smuggling of suitcase bombs or cruise missiles from submarines with low trajectories?

Mr. IKLE. This is a generic question and in the year 2010, which we are looking at the systems we are deciding on now, offensive systems and defensive systems, you know, we do have that risk. But we do not solve that risk by abstaining from strategic defense. We do not solve that with our retaliatory offensive forces.

Senator NUNN. Certainly that is true if you are protecting your deterrent, but if you are trying to protect cities, I do not follow your logic at all. If somebody can destroy New York City by detonating a bomb in a basement——

Mr. IKLE. You cannot protect a city against a smuggled bomb done by a power in control of nuclear weapons either by your deterrent force or by the SDI ballistic missile defense.

Senator NUNN. Well, I would assume you would have some deterrence if you—I would think the Soviets might be very well deterred by your own offensive capability.

Mr. IKLE. Would you know who did it in the year 2020?

Senator NUNN. Well, that is going to be a problem with proliferation and that gets to the point of working with the Soviets in that area. I think that is a valid point. But still how do you tell the people in New York City they are being protected in the year 2020 after spending $1 trillion?

General ABRAHAMSON. I do not believe that that is what we have ever really said. I think what we have said is that what we are trying to do is to have an effective enough capability against nuclear ballistic missiles that in fact—again using probabilities and a layered kind of defense—there is no assurance to a Soviet military planner that he can go ahead and achieve a military objective, and perhaps a secondary military objective might be to wipe out a large number of cities.

Obviously the right way for this to operate and to work is to never be used and be a defensive deterrent.

Senator NUNN. That definition stops far short of abolishing all nuclear weapons, because you are talking about basically protecting deterrence then, and you are talking about continuing to broad-

en expansion of what we call the mutual assured deterrence doctrine.

General ABRAHAMSON. I think it is a defensive deterrent that we are talking about.

Senator NUNN. Sure, defensive deterrent to protect your ability to retaliate.

General ABRAHAMSON. No, I think not merely your ability to retaliate—to prevent them from being able to hit your military capability.

Senator NUNN. Well, what military targets are you talking about? You just said that the planner could not assure the destruction of military targets, because what military targets would they want to hit unless we have got some——

General ABRAHAMSON. There are lots of kinds of retaliation that we are talking about. They do not necessarily have to be just the nuclear missiles. For example, if one wanted to protect our ability to resupply Europe, one wants to be quite sure that in fact you will not be subject just to an attack, a minimal kind of an attack, that in fact says that I will destroy all of your ports on the way and the key air fields which supply that resupply to Europe.

Senator NUNN. Are you assuming at this point we have gotten rid of our nuclear weapons?

General ABRAHAMSON. No. Frankly I am not dealing with that part of the question, sir. I am only trying to say——

Senator NUNN. Well, that is how the program has been defined.

General ABRAHAMSON. I think it has been defined in such a way that says that we want to be able to make the nuclear weapons themselves, the ballistic missile—that is the only portion of it that we are dealing with at this point in time—we want to take away its omnipotence as a weapon, the thing that makes it so powerful to a military planner that it becomes central, central to every part of his war plans. It becomes the last stage in his ability to say I can control escalation even in a conventional concept in Europe itself.

It may well become an important part of blackmail concepts, and not only against the United States but against our European or our other allies as well.

Senator NUNN. I still submit that you have greatly cut down the definition. I think that definition makes much more rational sense. I think that is not the same definition we have heard from the President or the Secretary of Defense.

Mr. IKLE. I was just going to answer that question before you raised it. The President has a very good expression for that. He said to make the missiles incapable of their mission, is the phrase he used, and that means that they cannot carry out the rational military mission, rational military attack, because of this attrition.

Senator NUNN. He said obsolete two or three times.

Mr. IKLE. He also said that. One can say not fulfill the military mission. They are obsolete in the sense like old military hardware. Now if you have an irrational government that wants to destroy a city by smuggling a bomb, whether it is the Soviet Government in the year 2010 or some other government, there you have to use other ways to protect yourself, and it may be very difficult.

Senator NUNN. Well, I do not think a rational government wants to primarily target cities or population unless they can get your defensive retaliatory capabilities.

Mr. IKLE. I said an irrational one would want to do it. The rational one would not.

Senator NUNN. So it seems to me that the way you deter is to protect your ability to retaliate.

Mr. IKLE. You make the missiles incapable of their mission to destroy our military capability, which has many assets, conventional assets and so on, so that he could not think of military victory, even if he destroyed several cities.

ARMS CONTROL NEGOTIATIONS

Senator NUNN. Let me ask one more question, Mr. Chairman. I promise this is the last one.

The dilemma we face, it seems to me, in arms control is that we have agreed that if we do not have a survivable system here that, as Paul Nitze says, it would decrease stability rather than enhance stability. In other words, forgetting whether we agree with the Soviets on anything, Paul Nitze is saying here if we reach the point in our research that we conclude that the ability to have survivable systems, whatever that word survivable means—I will accept your definition—then we are not going to go forward with this system, period.

Or, if we reach the point where we conclude that it costs more to defend on the margin than to counter with offensive forces on the margin, we are not going to go forward. He says both of those would basically be destabilizing.

Now we are in arms control negotiations. We may have a chance, I do not know, to get the Soviets to agree to such a dramatic cutback that we preserve our deterrent by their cutback on offensive systems. I do not know whether that is possible or not. Maybe it is and maybe it is not. That would be sort of the best case.

What if we conclude, and you have said that none of this is negotiable basically. We are not going to negotiate giving this up. What if we conclude either of these two things during the middle of the negotiations—that the system is not going to be survivable, or that on the margin offense is going to have the advantage over defense?

Would we then, I suppose logically, conclude it is something we could give up, particularly if we got a deep Soviet cutback?

Mr. IKLE. Well, if the research results are such that the technological expectations for it cannot be fulfilled. If it is not doable, then it would not make sense to continue it. On the other hand, you do not have much to trade then.

Senator NUNN. That is right. That is the next point. There is a point at which you have got an awful lot to trade, when both sides do not know what the results are going to be. But if we get to the point that Paul Nitze has described here and either one of these points, we not only will not be going forward with the SDI, because it would be destabilizing, but we also would probably, certainly if that is known, we would have lost our leverage on Soviet offensive forces.

Would you agree with that logic?

Mr. IKLE. It is a very good question. I think the reason we have been arguing against trading prematurely or giving up prematurely is that——

Senator NUNN. You changed your answer. Now you are saying that—you are not saying we will not trade; you are saying we cannot trade prematurely.

Mr. IKLE. We have tried the other route of trying to stabilize the arms competition with these undefended forces juxtaposed, and that did not work. We have been discouraged on that track, so we do not too quickly want to go back to that, and we rather hope and believe that this effort will succeed.

Senator NUNN. Well, the only thing I am saying, General Abrahamson, if you decide that either one of these questions is negative—that they are not survivable or the margin is favoring offense—I hope you will whisper that in the ear of some of our negotiators in time for them to become more flexible.

Senator WARNER. Sell it for a price?

Senator NUNN. Yes. You do not have to tell us; just whisper it, if you will, in the ear of the right people.

General ABRAHAMSON. I understand that guidance, sir.

Senator WARNER. Gentlemen, let me pose a question, both positively and negatively, and then you select how you wish to answer.

ADMINISTRATION'S POLICIES ON STRATEGIC DEFENSE

Did Mr. Nitze's speech reflect the policies of this administration on SDI, or did it in any way make points at variance?

Mr. IKLE. As I read it before it was given, I saw no points at variance and it is a short speech so it does not say everything that is to be said. I think today's testimony and Ambassador Nitze's own testimony, and more will be said. So it is a partial statement.

Senator WARNER. To the extent what he said is of interest to people, and it certainly is—you can judge by this hearing—it was consistent with the administration's policies on strategic defense.

Mr. IKLE. Right. The only point I made at the beginning is that the interpretation put to it could be too radical, more than I presume he would want to have said and more than I understand the administration intends to say.

Senator NUNN. Have I done that today?

Mr. IKLE. No, you have not, of course not.

Senator NUNN. I am capable of that.

Senator WARNER. General, do you want to make any comments?

General ABRAHAMSON. No, sir.

Senator WARNER. I want to thank both of the witnesses. This has been a long hearing, longer than we anticipated, and somewhat disjointed, but I wanted to accommodate our colleagues and also I felt it would be beneficial for you to learn firsthand from them, rather than questions for the record, the areas in this program with which they have concern.

I thank you, General, particularly, for your patience in foregoing some of your direct presentation until after the first round of questions.

Senator NUNN. Mr. Chairman, I join you in those comments and thank both of the witnesses. It has been a very very enlightening and interesting hearing. I appreciate it.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR STROM THURMOND

START

Senator THURMOND. Dr. Ikle, 24 years ago, an article appeared in *Foreign Affairs* titled "After Detection—What?" You were the author of what has turned out to be one of the most forward-looking writings dealing with arms control violations. In the article you talked about "restorative measures". Would you briefly describe your views today on any restorative measures we might take to counter Soviet arms control violations?

Dr. IKLE. As I outlined in the article, restorative measures cannot be limited to simply no longer observing those provisions that have been violated by the other party. Arms control agreements represent an integral entity. The specific provisions that compose them are not all equally constraining on both parties; on the contrary, agreements usually represent a balance among provisions with differing impacts on the two sides. To confine restorative measures to the specific provisions already violated, therefore, would be illogical. It would reward the party that committed the violation: that side could violate provisions it found most constraining, while the second party would still have to abide by other provisions that constrained it the most.

Beyond this general point, however, it would be premature at this time to comment on the possible restorative measures the United States might take in response to the many Soviet violations of different arms control agreements. Such measures are still under consideration by the Administration, and no final decisions have been reached.

SDI AND RESTORATIVE MEASURES

Senator THURMOND. Dr. Ikle, do you consider the Strategic Defense Initiative an alternative to restorative measures?

Dr. IKLE. No, the Strategic Defense Initiative is not an alternative to restorative measures. Soviet non-compliance is a serious matter. The Soviet Union is constructing a large phased-array radar that will contribute to its ABM potential. Because of the location and orientation of this radar, it constitutes a violation of the 1972 ABM Treaty. In addition, other Soviet actions represent potential, probable, and in one case, highly probable violations of that treaty. In fact, the aggregate of their ABM and ABM-related actions suggest that the USSR may even now be preparing an ABM defense of its national territory. Our objectives in the ongoing negotiations in Geneva are to reverse the erosion of the ABM Treaty and to seek equitable, verifiable arms control agreements which will result in real reductions and enhanced stability. It is fundamentally important that the Soviet Union take a constructive attitude toward full compliance with all arms control obligations.

The pursuit of SDI and equitable and verifiable arms control agreements are not mutually exclusive, in fact, they are mutually supportive. If a decision were made in the future to deploy an effective defensive capability, there would, of course, be broader implications for arms control. In this regard, effective defenses against ballistic missiles have the potential of complementing our policy of pursuing significant reductions in ballistic missiles forces.

STRATEGIC DEFENSE INITIATIVE

Senator THURMOND. During the late 1960s and early 1970s, antiballistic missile defense was thought to be too costly when compared to the countermeasures available at the time. Will that be the case with the Strategic Defense Initiative?

General ABRAHAMSON. The Strategic Defense Initiative is a research program, one of whose primary tasks is to answer that very question. We see emerging technologies that let us perceive targets and engagements with targets at great distances with great fidelity and in great quantities so that we can direct and control the individual engagements of a defense against large scale attacks. If, in a focused and timely way, we can show that this promise is a reality, then we have confidence we can show useful and affordable systems can be achieved. But in doing so, we must orchestrate the overall progress of many research activities at varying stages of de-

velopment maturity, so that we converge on a decision point with all critical issues resolved, not just a few here or a few there.

TALON GOLD PROGRAM

Senator THURMOND. There have been recent press reports that the Talon Gold Program is as much as 2 years ahead of schedule. Is this true?

General ABRAHAMSON. Not exactly. Talon Gold, the acquisition, tracking, and pointing (ATP) technology program inherited from the Defense Advanced Research Projects Agency (DARPA), has been restructured to more relevantly address ballistic missile defense (BMD) technical questions. In doing so, the program has been (1) reoriented to address all pointing needs of the Strategic Defense Initiative Program (SDIP), (2) reduced in scope early to get answers sooner, and (3) stretched out in the more demanding areas to provide time to answer the more difficult questions.

Senator THURMOND. Are any other programs far ahead of schedule?

General ABRAHAMSON. Actually, the program schedules are too new to characterize any specific piece as being "far ahead of schedule." In this initial year we have assimilated existing programs that predated the SDI and adjusted their schedules to be consistent with the overall goal of the SDI. Other parts of the program are new starts with new milestones and schedules. While the reductions in the 1985 program have necessitated postponement of some new starts and enhancements, many of our on-going activities are already showing substantial progress.

SDI AND CONVENTIONAL WAR

Senator THURMOND. Dr. Ikle, many critics of the Strategic Defense Initiative claim that it will make the world safer for large scale conventional war. Do you agree with that assessment?

Dr. IKLE. No, I do not agree with that assessment. The SDI program will not confine itself solely to exploitation of technologies with potential against ICBMs and SLBMs, but also technologies which have potential against shorter-range ballistic missiles as well.

An effective defense against shorter-range ballistic missiles could have significant impact on deterring aggression in Europe. Soviet SS20s and shorter-range ballistic missiles provide overlapping capabilities to strike all of NATO Europe. Soviet doctrine stresses the use of conventionally-armed ballistic missiles to initiate rapid and wide-ranging attacks on crucial NATO military targets throughout Europe. The purpose of this tactic would be to reduce significantly NATO's ability to resist the initial thrust of a Soviet conventional force attack and to impede NATO's ability to resupply and reinforce its combatants from outside Europe. By reducing or eliminating the military effectiveness of such ballistic missiles, defensive systems have the potential for enhancing deterrence against not only strategic nuclear war, but against nuclear and conventional attacks on our allies as well.

QUESTIONS SUBMITTED BY SENATOR DAN QUAYLE

BALLISTIC MISSILES IN THIRD WORLD

Senator QUAYLE. Recently, in International Security an article "Ballistic Missiles in the Third World," by Aaron Karc, detailed the emerging spread of ballistic missile technology to nations including India, Brazil, South Korea, South Africa, Taiwan, Israel, Libya, and Iraq. Each of these nations has fought hostile neighbors with whom they still are unfriendly. Some are our allies or may fight allies of ours. Might an anti-tactical ballistic missile system in some cases (e.g. if such a system was given to Pakistan) help address this threat? Would a spacebased anti-missile system be a help? If so, how?

General ABRAHAMSON. The option of defense against tactical ballistic missiles is one we hope to be able to support with the technologies being pursued in our research. The focus in this application would be on terminal defenses and the technologies for terminal defense are some of the most mature. Whether a space-based anti-missile system would help would depend on the range of the tactical ballistic missile and, therefore, the length of time the missile spends in the vulnerable boost phase. We would expect that the longest range tactical missiles—the intermediate range ballistic missile like the SS-20—could be engaged by the same space-based system deployed against intercontinental and sea-launched ballistic missiles (ICBM, SLBM). Space-based boost-phase intercept is unlikely to be effective against the short range (a few tens of kilometers) ballistic missile designed for use in the forward battle

area. These relatively slower moving systems tend to be more susceptible to terminal phase anti-tactical ballistic missile defense.

DEFENSE AGAINST TACTICAL MISSILES

Senator QUAYLE. Do anti-tactical ballistic missiles have to be more sophisticated than space-based systems in order to mitigate the tactical ballistic missile threat?

General ABRAHAMSON. Defenses against tactical ballistic missiles need not be more sophisticated than space-based systems. For example, intermediate range ballistic missiles (IRBMs) like the SS-20 do have shorter times of flight which stress the overall intercept time-line but they involve more limited geographical areas and have slower reentry velocities than ICBMs. Dr. Fletcher's Defense Technology Study Team examined the problem of defense against IRBMs. They noted that the short burn times and potentially low apogee (maximum altitude reached) of IRBMs pose a different set of defense problems. The shorter flight time of this ballistic missile and the limited geographical area threatened by IRBMs of the SS-20 class make a terminal defense system adaptable as an anti-IRBM system. The low apogees associated with some of the shorter range classes of IRBMs make midcourse intercept very difficult. However, a boost-phase intercept system of orbital high brightness lasers designed for SLBM kill may have substantial capability as a first tier defense against the IRBM. Defending a relatively small area such as Europe with overlapping coverage from mutually supporting terminal defense sites could be feasible.

PROTECTIVE SHELTERS

Senator QUAYLE. There has been a tremendous amount of attention paid recently to the vulnerability of NATO main operating bases to Warsaw Pact air attack and the need for NATO nations to spend more on building protective shelters for key Air Force assets. Aren't these same bases vulnerable to conventional and chemical tactical ballistic missiles such as the SS-21, SS-22, SS-23? Won't these bases remain vulnerable to this threat unless anti-tactical ballistic missile systems are deployed?

Dr. IKLE. Although in the future NATO's main operating bases may be subject to attack by tactical ballistic missiles (TBMs), currently programmed passive defense programs will ensure that bases are not completely vulnerable to TBM attack even without anti-tactical ballistic missile systems.

[Deleted.]

The Air Force has several passive defense programs underway which will reduce the vulnerability of NATO main operating bases to conventional/chemical TBM attack. The ongoing chemical warfare defense program will provide both individual and collective protection to NATO personnel against chemical attack. These measures ensure that Air Force personnel can continue to operate in a chemical environment. Other passive defense measures, including semi-hardened protective shelters and alternate launch and recovery surfaces, will protect aircraft from conventional TBM attack and ensure that aircraft can continue to operate even after such an attack. These passive defense measures are equally effective against attacks by aircraft.

The Army and Air Force are jointly evaluating the merit of passive defenses and active antitactical ballistic missile systems under the auspices of the Joint Anti-Tactical Ballistic Missile Special Study Group. The group should have a final report by the end of June 1985.

SDI AND ALLIED PARTICIPATION

Senator QUAYLE. Recently, the Japanese Prime Minister told the Japanese Diet that Japan would be willing to help the United States develop a ballistic missile defense system. What sort of help might the Japanese be willing to give? Are any NATO nations willing to help us? If so how?

Dr. IKLE. The purpose of SDI is to determine whether there are cost-effective defensive technologies that could enhance deterrence and increase stability. Because our security is inextricably linked to that of our friends and allies, we will work closely over the next several years with our allies to ensure that, in the event of any future decision to deploy defensive systems, allied as well as U.S. security against aggression would be enhanced. The United States will, consistent with our existing international obligations including the ABM Treaty, proceed with cooperative research with the allies in areas of technology that could contribute to the SDI research program.

We welcome the participation of our allies interested in contributing to our research efforts. Discussions with our allies will focus on how each ally's scientific and

technical expertise could be used most effectively and would pave the way for meetings between scientists, engineers and industrialists on both sides.

SPREAD OF BALLISTIC MISSILE TECHNOLOGY

Senator QUAYLE. Does the spread of ballistic missile technology to the Third World pose a serious threat to U.S. interests in the out years? If so, do you believe that everything is being done that can be to control the spread of this technology?

Dr. IKLE. Yes, such a spread would magnify the consequences of nuclear proliferation. The administration is taking full account of this potential threat. I cannot think of any additional measures required in the near term.

Senator WARNER. Gentlemen, again, I want to thank you for your presence and the fine presentation.

[Whereupon, at 5:37 p.m., the subcommittee adjourned, to reconvene subject to the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1986

TUESDAY, FEBRUARY 26, 1985

U.S. SENATE,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

ARMS CONTROL

The committee met in open session, pursuant to notice, at 9 a.m. in room SDG–50, Dirksen Senate Office Building, Senator Barry Goldwater (chairman) presiding.

Present: Senators Goldwater, Thurmond, Warner, Humphrey, Cohen, East, Wilson, Denton, Gramm, Nunn, Stennis, Hart, Levin, Kennedy, Bingaman, Dixon, and Glenn.

Staff present: James F. McGovern, staff director and chief counsel; Arnold L. Punaro, staff director for the minority; Jeffrey H. Smith, minority counsel; Christine C. Dauth, chief clerk; Gerald D. Strickler, printing and documents clerk; Robert G. Bell, Robert F. Bott, Douglas R. Graham, William E. Hoehn, Jr., George K. Johnson, Jr., professional staff members; and Karen A. Love, staff assistant.

Also present: Gerald J. Smith, assistant to Senator Goldwater; Romie L. Brownlee, assistant to Senator Warner; Robert P. Savitt, assistant to Senator Cohen; Henry D. Sokolski, assistant to Senator Quayle; John L. Roddy, assistant to Senator East; Mark J. Albrecht, assistant to Senator Wilson; Allan Cameron, assistant to Senator Denton; John Rasmussen, assistant to Senator Gramm; Francis J. Sullivan and Mary A. Shields, assistants to Senator Stennis; Janne E. Nolan, assistant to Senator Hart; Jeffrey B. Subko, assistant to Senator Exon; Peter D. Lennon, assistant to Senator Levin; James Steinberg, assistant to Senator Kennedy; Edward McGaffigan, Jr., assistant to Senator Bingaman; Charles C. Smith, assistant to Senator Dixon; and Phillip P. Upschulte, assistant to Senator Glenn.

OPENING STATEMENT BY SENATOR BARRY GOLDWATER, CHAIRMAN

Chairman GOLDWATER. The meeting will come to order. This morning we convene in open session to receive testimony on the arms control implications of upcoming votes on the Peacekeeper missile system and on the other elements of the strategic modernization program that are contained in the President's fiscal year 1986 budget request.

I take great pleasure in welcoming our witnesses, Hon. George Shultz, Secretary of State, and Hon. Caspar Weinberger, Secretary of Defense. Their joint appearance here this morning, which if I am not mistaken is the first such appearance in some time, will provide an opportunity to make the foreign policy and military case for strategic modernization simultaneously.

In fact, I might confess to both of you that at one time a number of years ago I made a recommendation that the Armed Services Committee and the Foreign Relations Committee be made one. Really, I do believe that the more one knows about the other the better off we would both be in either one's field.

While not the subject of today's hearing, I would note that I have closely followed press accounts of the apparent controversy between you gentlemen on the application of military force. My current understanding is that you both agree, as I do, that policymakers should consider the potential for broad political support by an informed public before deciding on the application of force.

Within the month, this 99th Congress will take up the unfinished business of the 98th Congress and begin consideration of resolutions of approval to release production funds for 21 of the 40 Peacekeeper missiles requested in the fiscal year 1985 budget.

Shortly thereafter, this same Congress will be considering whether to provide an additional 48 Peacekeeper missiles, whether to fund a substantial increase in research funding for the strategic defense initiative, and whether to sustain other elements of the President's Strategic Modernization Program. Also within the month, negotiating teams from the United States and the Soviet Union will be meeting in Geneva to resume arms control negotiations after more than a year without such negotiations.

We in the Congress cannot ignore the connection between these events. The program decisions that we are asked to make bear directly on our national security, and they bear just as directly on the arms control process. Ambassador Rowny, our former START negotiator, has spoken often of the importance that his Soviet counterparts attach to the MX missile and of the importance of congressional support for this program to the success of the START negotiations. The same relationship of MX with arms control was a central finding of the distinguished Scowcroft panel in their report.

Similarly, we are all keenly aware of the importance that the Soviets attach to the strategic defense initiative as they enter into the upcoming negotiations. In fact, I think it is fair to say that the SDI played an important role in inducing the Soviets back to the negotiating table.

The hearing this morning will contribute to the record we will need for informed Senate debate and action on the upcoming MX votes, and on the fiscal year 1986 budget request. It is essential that we and the public appreciate the importance—from the viewpoint of the top administration officials—of continued congressional support for strategic modernization, both to enhance our national security and to strengthen the hand of our negotiators in Geneva.

We in the Congress, on the basis of this testimony, will have to judge the effect, positive or negative, that congressionally imposed unilateral actions, such as funding reductions for strategic pro-

grams, moratoria, or legislation that conditions funding on the outcome of arms control will have on our ability to negotiate effectively with the Soviets.

The Chair recognizes that an open session will not afford a full opportunity for administration witnesses to make all the relevant national security issues a part of the record. For this reason, the Strategic and Theater Nuclear Forces Subcommittee will hold additional hearings wherein the classified aspects of the Peacekeeper Program and other strategic modernization with relevance to arms control can be considered by Senators.

[The prepared statement of Senator Alan J. Dixon follows:]

PREPARED STATEMENT OF SENATOR ALAN J. DIXON

Mr. Chairman, I welcome the opportunity to listen to Secretaries Shultz and Weinberger today on one of the most important matters facing our country—arms control and the need for the MX.

The Administration is embarking on vital negotiations with the Soviet Union. There are many questions facing the Senate Armed Services Committee that will have an impact on the Geneva talks: MX and SDI to name just two. Should we fully fund our strategic program because we are involved in negotiations with the Soviet Union, or could some of these programs be reduced without harming our posture?

As we on this committee begin our discussion of the Defense budget, we must also consider the huge deficits that this country faces. I believe we must realize that Defense simply has to share some of these cuts to reduce the deficit. Therefore, we are faced with cutting the strategic systems or reducing our conventional weapons systems. There are many who feel that we have spent too much at the strategic level and not enough for the conventional side.

So I look forward to today's discussion by our distinguished witnesses and hope that we can come to a mutual understanding on what must be spent for defense while not weakening our position in Geneva.

Chairman GOLDWATER. The Chair understands that both of our witnessess have prepared statements. I will ask that you each present or summarize your statements in turn before we begin questions by the Senators, and I would suggest that Secretary Shultz start first. I only do that because "S" comes before "W."

STATEMENT OF HON. GEORGE P. SHULTZ, SECRETARY OF STATE

Secretary SHULTZ. Thank you. Mr. Chairman and distinguished members of this committee.

I listened attentively to your opening statement and I agree with the various points that you made, and in particular the close interplay between our defense capability and our strategic programs on the one hand and our abilities to conduct an effective foreign policy on the other. They are two sides of the same coin and must be considered together.

I welcome this opportunity to appear before you to speak in support of the President's Program of Strategic Modernization. This subject is of enormous importance to our diplomacy because of the direct impact of strategic modernization on our national security, our arms control objectives, and our most fundamental foreign policy goals.

STRATEGIC MODERNIZATION AND FOREIGN POLICY

As Secretary of State, I am acutely conscious of the strength or weakness of American power, because it directly affects our ability to achieve our most fundamental goals: the defense of our values

and our interests and the construction of a safer, freer, and more prosperous world. Power and diplomacy, as you noted, Mr. Chairman, are not separate dimensions of policy; they are inextricably linked together.

That is why I am here today to urge support for strategic modernization, and in particular for the MX Peacekeeper Missile Program, which is a central pillar of that modernization.

As leader of the democratic nations, we have an inescapable responsibility to maintain the strategic balance, and only we can maintain it. If our determination flags, we shake the confidence of our friends and allies around the world, and we weaken the cohesion of our alliances. If we in America are strong and united in our commitment to peace and international security, then those who rely on us and upon whom we rely have the confidence to move together with us toward our shared goals.

Modernization of our strategic forces is essential. The Soviet strategic buildup has continued relentlessly. Since we deployed our most modern type of ICBM, the Minuteman III, the Soviet Union has deployed three new types of ICBM's—the SS-17, SS-18, and SS-19—including 360 SS-19's, roughly comparable in size with the MX, each with six warheads, and 308 of the much larger SS-18, each with 10 warheads. Moreover, within the next 2 years the Soviets will begin deploying two additional types, the SS-X-24 and SS-X-25. This means five new Soviet ICBM's compared to one, the MX, about which you are debating, for the United States.

A credible, flexible American strategic posture is vital to the stable balance of power on which peace and security rest. And the MX is a vital element of that stable balance. It represents the response that four successive administrations, both Democratic and Republican, have believed necessary to offset, at least partially, the formidable Soviet ICBM arsenal.

It was permitted by the SALT II Treaty, and indeed its contribution to the strategic balance was one of the premises on which that treaty was based. The bipartisan Scowcroft Commission concluded, and I am convinced, that the MX remains an essential component of a modernized strategic triad.

If the Soviets could strike effectively at our land-based ICBM's, while our own land-based deterrent lacked any comparable capability, they might believe that they had a significant advantage in a crucial dimension of strategic balance. They could seek to gain political leverage by a threat of nuclear blackmail. Such a crucial imbalance in strategic capabilities could well make them bolder in a regional conflict or in a major crisis.

As the Scowcroft Commission put it:

> A one-sided strategic condition in which the Soviet Union could effectively destroy the whole range of strategic targets in the United States, but we could not effectively destroy a similar range of targets in the Soviet Union, would be extremely unstable over the long run and would clearly not serve the cause of peace.

We must move ahead with deployment of the MX now because it represents a credible deterrent today. After years of planning and billions of dollars in effort, only the MX offers a way toward redressing the serious strategic imbalance now.

Many critics of the MX have focused on the issue of MX basing in relationship to survivability. There are three points I wish to make.

First, Soviet planners in the uncertainty of war would have to take into account that some of our MX missiles would survive attack and would be used to retaliate against those targets the Soviets value most highly, including Soviet missiles held in reserve for further attacks against our country.

Second, the survivability of the MX must be viewed in conjunction with the other elements of our strategic triad. The three legs of the triad, bombers, submarines, and land-based ballistic missiles, strengthen deterrence by greatly complicating Soviet planning. If the Soviets were to contemplate an all-out attack, they would be forced to make choices that would significantly reduce their effectiveness against one leg of the triad in order to attack another.

For example, it is not possible to attack our bomber bases and our ICBM silos simultaneously, without allowing certain retaliation. Indeed, deterrence rests upon the Soviet planners knowing that they cannot contemplate a successful, disarming first strike.

Third, silo hardening can be improved significantly in the future and thereby increase the survivability of the MX force. The Scowcroft Commission reported on this capability and the Congress has funded its research. The prospects are firm and promising and will ensure that the MX will remain a key element of the triad far into the future.

Additionally, it is important to understand that the whole of our strategic triad is greater than the sum of the individual parts. Viewed in the full context, the MX will strengthen the whole of our triad, on which our security has rested for many years, and in so doing it will strengthen the fabric of deterrence and peace.

STRATEGIC MODERNIZATION AND ARMS CONTROL

At this moment, the MX Program plays a pivotal role in advancing our arms control goals as well. One thing we have learned over the years is that the Soviets respect strength and firmness. I am convinced that our firmness and that of our allies in the last few years—in proceeding with the INF deployments and resisting Soviet efforts to drive a wedge between the allies—persuaded the Soviets that they could not achieve their objectives by political pressure, that they could not sit back and wait for unilateral concessions, but they must bargain at the table instead.

Thanks to the West's cohesion and determination over this period—and thanks to the Congress' bipartisan support for the strategic modernization program over the past 3 years—our negotiating position today is strong. The Soviets must realize that we have the will to protect our security in the absence of arms control agreements, and that it is in their interest as much as ours to seek ways to reduce nuclear arsenals and the dangers of war. This basis of strength improves the prospects for successful negotiations.

These new weapons are not bargaining chips. They are part of the very strength on which real bargaining rests. They represent much-needed modernization, consistent with existing arms control agreements. They are an essential element of our deterrent pos-

ture, and they are the foundation on which an effective and balanced arms control regime can be built.

NEGOTIATING WITH STRENGTH AND UNITY

As you know, a new round of arms control negotiations is about to begin in Geneva. The American people and their Government, the Congress and the President, all share the hope that these negotiations will bear fruit. We must be prepared to defend our ideals and interests whether our negotiations are successful or not.

The United States has, however, long sought a more constructive and productive relationship with the Soviet Union. We emphasized throughout 1984 the importance of resuming a United States-Soviet dialog aimed at reductions in nuclear arsenals.

The year 1985 has begun on a positive note. The outcome of the January meetings with Foreign Minister Gromyko marked a potentially important beginning. The agreement to start new negotiations in Geneva on March 12 brings the resumption of the dialog on the most important strategic issues now facing our two nations.

We will use these negotiations to discuss fully our views on the evolution of strategic deterrence, including our hope that the Strategic Defense Initiative research will allow us to move to a new strategic environment, based on defense and not simply the prospect of mutually assured destruction. We must substitute mutually assured security for mutually assured destruction as our concept.

We are now engaged in a process that can produce beneficial results for the United States and for our allies and for world peace and security. Success, however, will require firmness and determination, a degree of flexibility, and a degree of caution. It will also require something even more basic: Unity at home on the importance of these requirements and of our fundamental strength.

As we move toward these negotiations, we must proceed as a united people. When we sit down at the table to discuss these questions with the Soviet Union, it is essential that we speak with one voice, that we not present the picture of a nation in conflict with itself, giving the Soviet Union either openings to exploit or false hopes that we will make unilateral, unreciprocated concessions.

The negotiations we are about to embark upon are between the United States and the Soviet Union. We cannot and must not allow them to deteriorate into negotiations among ourselves.

The negotiators the President has chosen to represent us at Geneva, including your former colleague John Tower, are among the most intelligent, able men in the land. They are tough negotiators. They will represent our country, defend our interests, and pursue our goals with skill and dedication.

In a sense, however, these men are only the tip of the pyramid. Their work in Geneva will be supported by their respective delegations and by the expertise and commitment of hundreds of people in the U.S. Government. But the real foundation of the whole edifice, on which its strength really depends, is the degree to which they are supported also by our Congress and public. Our arms control efforts cannot succeed without this support.

Mr. Chairman, this is no time to cast doubt on our national resolve. When we send our negotiators to the table in Geneva, we

owe it to them and to our country to send them in with the strongest possible negotiating position and with the full backing of the Nation.

And that means not suggesting unilateral concessions that might diminish the incentives the Soviets have to talk. That means not cutting programs vital to our strategic posture. It means coming together behind a solid negotiating position that offers the best hope for achieving the goals I know we all seek.

Thank you, Mr. Chairman.

Chairman GOLDWATER. Thank you, Mr. Secretary.

Secretary Weinberger?

STATEMENT OF HON. CASPAR W. WEINBERGER, SECRETARY OF DEFENSE

Secretary WEINBERGER. Mr. Chairman and distinguished members of the committee:

It is always a pleasure to appear before this committee, and I certainly appreciate your calling this special hearing this morning.

It was in 1972 that the United States and the Soviet Union signed the SALT I Treaty. We were in the process of completing then the replacement of 550 Minuteman I missiles with the Minuteman III. The Soviets were completing development of the SS-9's and the SS-11's, and many here in this country believed and hoped that the treaty and the impending termination of both sides ICBM programs augured an era of nuclear stability.

Within several years, however, it became apparent that the Soviet leadership was not satisfied with that situation. New Soviet missiles were being developed. New techniques for silo hardening were being explored there. In 1973 we began debating possible responses.

By the mid-1970's, the Soviet missiles were being flight tested extensively, the new ones. We continued to debate possible responses. By 1976 and 1977, the Soviets began major deployment of three types of new fourth generation ICBM's—the SS-17's, SS-18's, and SS-19's. These missiles were housed in newly modified silos which were far harder than our Minuteman silos—and which were quite able to withstand retaliation by our then existing ICBM force. With the exception of a small program to replace the warheads of about half of our Minuteman III missiles, we continued to debate possible responses.

Today there are 808 SS-17's, SS-18's, and SS-19's, with 6,000 new warheads, deployed, ready to shoot. Two new Soviet ICBM's—the SS-X-24 and the SS-X-25—their fifth generation, are now being flight tested. Our response, the Peacekeeper, is still in the flight test stage, and we have had 12 years of inconclusive debate.

Our Peacekeeper flight tests have been highly successful. We have been achieving accuracies, Mr. Chairman, that are far better than even our stringent design specification. And yet, despite this and despite our cumulative investment of now nearly $13 billion in the Peacekeeper Program, and despite the Soviet strategic programs, some still counsel that we should stop preparations to deploy this missile and continue to debate what to do.

Mr. Chairman, 12 years should have been enough debate for everyone. Now the earliest IOC for this much-needed modernization of our triad is December 1986. We cannot afford to wait any longer. Our delay has contributed to the current strategic imbalance that we now face and which we must correct.

For the deterrence to remain effective, we must make certain that the Soviet leadership understands that our retaliation will raise the cost of their aggression to unacceptable levels to them. This is not an easy task because, while we were congratulating ourselves in the 1970's that we had persuaded the Soviet Union to accept the concept that nuclear war was not winnable, during the same period the Soviet leadership was embarking on a massive program to undercut our deterrent.

Viewed in its totality, that effort is now clear:

By modernizing and expanding what was already in the world's largest and most sophisticated air defense system, the Soviets sought to blunt the bomber leg of our triad;

By building a limited first strike capability in their SS–18's and SS–19's, the Soviet leadership sought to develop the ability to preempt U.S. retaliation; and

By hardening missile silos and launch control facilities, and by proliferating, dispersing, and hardening hundreds of command and control facilities, the Soviets sought to create an ability to absorb a retaliatory blow and nevertheless maintain the military power, political and military control, and war supporting potential essential to the Soviet state.

If, because we failed to respond to these efforts, the Soviet leadership convinces itself that the risks inherent in threatening or actually using military force against us or our allies are reduced to an acceptable level to them, then deterrence indeed would be jeopardized.

Fortunately, we are now responding. We are rebuilding our triad. We have deployed air-launched cruise missiles on the B–52's. The first B–1 was delivered last year. We have corrected the problems in the Trident submarine program. We have a steady effort underway there.

But a strong triad must have three strong legs, and we do not yet have a modernized ICBM force. We do not yet have an ability to threaten prompt and credible retaliation against those key hardened Soviet assets.

It was in light of these somber facts that the administration's Commission on Strategic Forces, the so-called Scowcroft Commission, reviewed our strategic deterrent in early 1983 and reached the conclusions that have already been quoted to you. And it was in the light of these facts that the Commission proposed, and the President submitted to Congress, a phased plan for the modernization of ICBM's.

To redress these important near-term deficiencies, the plan called for the deployment of 100 Peacekeeper missiles in existing Minuteman silos. There is no other available system which in the near term—and that is what is vital—can demonstrate so convincingly that, despite their investment in hardening and proliferation, the Soviet leadership cannot expect to win a nuclear conflict. Thus we need the Peacekeeper for deterrence.

We also need the Peacekeeper Program in order to have a successful small single warhead ICBM. Many of the important components of the new small missile will be derived from the Peacekeeper, including its guidance and control hardware, its computer components and software, ordnance support systems, and warhead. As a result, our plans for evolving into a more stable strategic environment—not only for the late 1980's but for the early 1990's—depend crucially on the actions the Congress takes this year. Furthermore, Peacekeeper will encourage the Soviets to begin to reduce their reliance on large, heavily MIRV'ed ICBM's, thereby contributing both to the survivability of our new small ICBM, by reducing their ability to mount barrage attacks, and to further increases in stability in the strategic area.

As the committee knows, we are also about to resume negotiations with the Soviet Union in Geneva. We are seeking significant mutual and verifiable reductions in the strategic arsenals of both sides. As George Shultz has just indicated, a continuing Peacekeeper Program is vitally important to our ability to achieve the deep reductions that we seek. There are two obvious and very crucial and critical reasons for this.

First, if we indicate that we are not going to correct our current deficiencies, the Soviets have virtually no incentive to negotiate seriously. Why should they? Why should they seek to reduce their arsenals if we have signaled that we are going to permit them to maintain and perhaps expand advantages they currently enjoy.

And second, if we should halt or slow a program that we ourselves recognize to be critically important, we will certainly convey unmistakably a message to the Soviet leadership that we lack the will and the resolve to achieve our goals in the world. So then why should they believe that we are committed to reducing arms or maintaining a balance of power in the absence of reductions?

The Scowcroft Commission addressed that point specifically when they said:

> It is illusory to believe that we can obtain a satisfactory agreement with the Soviets limiting ICBM deployments if we unilaterally terminated the only new U.S. ICBM program that could lead to deployment in this decade. Abandoning Peacekeeper at this time in search of a substitute would jeopardize, not enhance, the likelihood of reaching a stabilizing and equitable agreement.

To succeed at Geneva, we must show the same steadfastness and determination which encouraged them to change course and return to the negotiating table. Their eyes are on us today.

Finally, let me conclude by looking just a bit further into the future. As the committee knows, the President and I and Secretary Shultz are all committed to exploring new technological possibilities which may permit us to eliminate the threat posed by ballistic missiles of all ranges. We are encouraged by the results of our initial studies and our research to date.

We are optimistic that these technologies can be developed and that fully effective, cost effective, and survivable defenses can be created. But while we do that research, we need to continue effectively to deter attack. Once a decision to pass beyond research to development is made, we will still need to deter effectively. And as defensive systems are deployed over a period of years, we will need to ensure that this transition period, so-called, is a stable one.

A strong and modern triad will provide the deterrence we need to move down this road. A strong and modern triad must have a strong ICBM leg, and a strong ICBM leg must include 100 Peacekeepers. I urge the committee to take the lead in moving the Congress to remove the restrictions placed on the 1985 Peacekeeper procurement funding, take down that fence, and to approve our request for the 1986 production.

Yesterday, Mr. Chairman, the committee was briefed on our whole strategic nuclear doctrine and our ability to carry out our national objectives, and that briefing showed our deterrent capability today and its shortcomings. It also provided the rationale for increasing our deterrent capability through the modernization of the triad.

The modernization program is essential for a credible deterrence through the nineties, and I am authorized to state that the Joint Chiefs of Staff fully support this modernization effort, particularly the need to deploy the Peacekeeper now.

Introduction of Strategic Forces Systems by Year

USSR

*Available information on the SS-16 is inconclusive, but indicates probable deployment

Mr. Chairman, I thought you might be interested in a brief chart, just one chart over there, that will show the differences in developments in the last few years: the red indicating the strategic systems the Soviets have introduced over the years since 1962, and the blue indicating ours, with a long gap in all of the strategic systems in the seventies, and the fact that we are just now starting with the manufacture of the 21 authorized MX's, authorized in fiscal year 1984.

But that chart I think shows both submarines and missiles and aircraft, strategic aircraft, the gaps between the two countries, and the reason why we believe our strategic deterrent is eroding and that that erosion needs to be stopped.

Thank you very much, sir.

Chairman GOLDWATER. Thank you very much, Mr. Secretary. I just have two questions before we go on to the committee.

Secretary Shultz, how would you respond to those who assert that either MX or SDI, but not both, are necessary to our negotiating posture?

Secretary SHULTZ. Well, I think first, Mr. Chairman, they are necessary to our strategic posture. That is the first point. It seems to me that we should never do things just because of our negotiating posture. We should do them because they are in the interests of our defense posture.

I believe the MX deployment is a necessary part of strategic deterrence that is in hand and capable of being deployed right now. And the idea of introducing into our strategic posture a greater and greater element of defense capability as such, as illustrated through the strategic defense initiative research program, is an investment in the future, a future that can possibly hold a far more comfortable and secure form of deterrence than the present situation.

So I think they are both important investments. Now, as far as the negotiations are concerned, clearly our overall strength and will and determination, not only of ourselves but of our allies, is a key to any successful negotiation. And these programs, which offer us much additional strength, obviously contribute to that posture, and therefore I think are key elements in the negotiating posture of the United States at Geneva.

Chairman GOLDWATER. Thank you.

Senator Nunn?

Senator NUNN. Thank you, Mr. Chairman.

Secretary Shultz, a few days ago—I am not sure of the exact date—Paul Nitze made a speech and the main focus of it was on the Strategic Defense Initiative, and I want to read a couple of paragraphs from that speech and see if you and Secretary Weinberger would agree with the way he has described it.

On page 4 of the speech he says:

> The criteria by which we will judge the feasibility of such technologies will be demanding. The technologies must produce defensive systems that are survivable. If not, the defenses would themselves be tempting targets for a first strike. This would decrease, rather than enhance, stability.

Do you agree with that description by Paul Nitze?

Secretary SHULTZ. Yes.

Senator NUNN. Secretary Weinberger?

Secretary WEINBERGER. Yes, of course.

Senator NUNN. He goes on to say:

> New defensive systems must also be cost effective at the margin. That is, it must be cheap enough to add additional defensive capabilities so that the other side has no incentive to add additional offensive capabilities to overcome the defense. If this criterion is not met, the defensive systems could encourage a proliferation of countermeasures and additional offensive weapons to overcome deployed defenses, instead of a redirection of effort from offense to defense.

Secretary Shultz, do you agree with that?

Secretary SHULTZ. Basically yes, although I think it depends somewhat on the nature of the defensive system. But even with that qualification, I think the answer has got to be yes.

Senator NUNN. Thank you.

Secretary Weinberger?

Secretary WEINBERGER. Yes. I think that Paul is talking more about a standard traditional ABM ground-based system there, that is capable of being overwhelmed. The kind of strategic defense we are talking about, that would destroy Soviet missiles by nonnuclear means before they get into the atmosphere, is quite a different kind of system.

But I think anybody would agree that anything has to be cost-effective.

Senator NUNN. Well, you would agree with what he says, "If this criterion is not met, the defensive systems could encourage a proliferation of countermeasures and additional offensive weapons to overcome" it?

Secretary WEINBERGER. That is what I was trying to respond to, Senator, that the system we are talking about is not the ground-based ABM system.

Senator NUNN. He did not say anything about ground-based. He is talking about the broad concept of SDI.

Secretary WEINBERGER. But when you are talking about capable of being overwhelmed you are talking about a different kind of system than we are talking about with respect to our strategic defense initiative. You can overwhelm the ground-based ABM, a Sprint or Spartan system.

We do not believe that, if we can develop what we are talking about, that it would be capable of being overrun, nor would it encourage proliferation. But it certainly ought to be a cost-effective system, there is no question about it.

Secretary SHULTZ. But if you take that definition, I think you can readily see how such a system, if it works, is cost effective.

Senator NUNN. Well, the point is, I am not trying to argue whether the system is going to be cost effective. I am trying to establish, as he has tried to establish in this speech, whether you agree with the parameter that if it is not cost effective, if the offensive forces can overwhelm the defense at the margin cheaper than you can build new defensive systems, whether you agree that that in itself would encourage proliferation and we should not go forward?

Secretary WEINBERGER. One of the things we are trying to do, Senator, is to design a system so that it will not be subject to the things he is worried about. Any system should be cost effective in the sense in which he stated and which you have quoted.

Senator NUNN. I take it, then, you generally agree with what Paul Nitze said here on that point?

Secretary WEINBERGER. On those quotes that you read from the speech, yes.

Senator NUNN. Is there anything in the speech you do not agree with?

Secretary WEINBERGER. I just want to be sure that we understand we are talking about a system that would not be subject to

being overwhelmed by proliferation, that the existing types of ABM have been.

Senator NUNN. Well, you hope that is what we are talking about. That is what the research is all about, is it not?

Secretary WEINBERGER. We have not got the system yet. That is why we are doing the research.

Senator NUNN. Correct. That is the goal of the research. That is what we are trying to establish.

Secretary Weinberger, article 5 of the ABM treaty states: "Each party undertakes not to develop, test, or deploy ABM systems or components which are sea-based, air-based, space-based, or mobile land-based." According to the understanding we worked out with the Soviets in the Standing Consultative Commission, what defines the line between research and development? How do you define when research stops and development starts?

Secretary WEINBERGER. Well, I think that the treaty itself does not give too good a guide on that. But if you are leading toward the basic question as to whether we would violate the ABM Treaty, the answer is clearly no, we would not.

There is another section of the ABM treaty which, as you know, provides provisions for amendment and changes of the treaty itself. And if we got to the stage where we believed that, because of successful research, we were ready to do any of the things that were precluded by the treaty, we would then, I assume, serve notice that the treaty needed to be adjusted to permit us to do what we felt it essential to do and take the necessary steps to do that.

But we would not violate the treaty.

Senator NUNN. So you would adhere to whatever the line is between research and development unless you renegotiate or serve notice under the treaty?

Secretary WEINBERGER. Well, we would renegotiate or serve notice of changes that we wish to have made in the treaty. Those procedures are provided in that treaty itself.

Senator NUNN. Could you furnish for the record some definition of how you are going to proceed and the distinction between research and development, so we will have something to judge that by over here as we are trying to approve budgets?

Secretary WEINBERGER. Well, we can certainly try. We are nowhere near that stage now, because we are still in the research. But we could try to guess at what might be a definition that would fall within the treaty. We will certainly try to help on that.

[The information follows:]

Prohibitions on development begin when field testing is initiated on either a prototype or breadboard model of an ABM component. Gerald Smith's testimony to the Senate Armed Services Committee during the 1972 ABM Treaty Ratification hearings made it clear that this definition is based upon the ABM Treaty negotiating record.

Smith's statement is quoted below:

"The SALT negotiating history clearly supports the following interpretation. The obligation not to develop such systems, devices, or warheads would be applicable only to that stage of development which follows laboratory development and testing. The prohibitions on development contained in the ABM Treaty would start at that part of the development process where field testing is initiated on either a prototype or breadboard model. It was understood by both sides that the prohibition on 'development' applies to activities involved after a component moves from the laboratory development and testing stage to the field testing stage, wherever performed. The

fact that early stages of the development process, such as laboratory testing, would pose problems for verification by National Technical Means is an important consideration in reaching this definition. Exchanges with the Soviet Delegation made clear that this definition is also the Soviet interpretation of the term 'development'."

Senator NUNN. Do we have a definition now of when development starts and how you define development?

Secretary WEINBERGER. Not that I know of. I do not think the treaty has ever been formally interpreted by any court.

Senator NUNN. By our own definition. I do not mean international courts.

Secretary WEINBERGER. We have various working definitions of deployment and things of that kind. We also have definitions of research, and what we are doing at the moment is clearly within and permitted by the treaty.

Senator NUNN. Well, I understand that and I agree with that. I'm just trying to say, how do we make a judgment over here in the difference between research and development and how do you make a judgment in the Pentagon? And that seems to me to be a crucial definition.

Secretary WEINBERGER. If, as and when we approach that point, we would certainly want to try to help with a working definition. We have definitions that apply to other weapons systems, but we're not at that stage now.

Senator NUNN. Well, before we get to that stage we have to have a definition. So if you would submit to us whatever your definition is, I would appreciate it.

Secretary WEINBERGER. Right.

Senator NUNN. Article 1, paragraph 2 of the ABM treaty states: "Each party undertakes not to deploy ABM systems for defense of the territory of its country and not to provide a base for such a defense."

Do we have a definition or have we worked out anything with the Soviets that interprets those words, "not to provide a base for such a system"?

Secretary WEINBERGER. Not that I am aware of.

Senator NUNN. Secretary Shultz?

Secretary SHULTZ. Well, in a general way, the drafters of the treaty had a concept in mind, and that is one of the things that worries us about Soviet ABM and ICBM-associated developments. That is one of the things that worries us about the Krasnoyarsk radar and some of the ABM-related activities that we are continuing to follow closely.

That puts forward the question, are they getting themselves in a position where they can break out of the single site defense into a national defense, and I am sure that is one of the questions we will want to discuss in Geneva.

Senator NUNN. I agree with that. I think it is important to define it. I think we have also got to define this research and development. I do not think we can define research as everything we want to do and are doing, and development as what we are not going to do.

I mean, we have got to have some definition of it, where it starts and stops, in terms of making judgments.

Secretary SHULTZ. Well, it is one of those things, Senator, it seems to me—and Secretary Weinberger is much better versed in this than I am—that you are always in the position—having negotiated a treaty back in 1972—of trying in the context of 1985 technological developments to put 1972 words together with present technology. This leads to a need for continuous discussions.

And it just is not a rigid and easily defined thing when you get to questions like testing, and what kind of a test is this versus that and so on; it is a subject that merits a lot of thought and effort.

Secretary WEINBERGER. Senator, if I might, as one of the problems you get with these negotiations, either a treaty or other kind of negotiation, as people start asking uncomfortable and difficult questions that you have been asking, why, the tendency is to use broad words on paper to get a piece of paper signed and have an agreement. And it is called calculated ambiguity and all kinds of things like that, so that you do not have to approach these.

But that is one of the things we hope to avoid in the new agreements, if we can make them, and that is to have them be clear and simple and specific and comparatively easy of interpretation.

Senator NUNN. Let me ask one other question on another subject, and I am sure my time is running down. Do we have your final word on the basing mode for the MX? In other words, is it correct for us to assume in the course of this MX debate that we are not going to, during the deployment of the first 100 MX's, have any other basing mode other than what you have already submitted?

Secretary WEINBERGER. That is my understanding, Senator. This is the mode that was submitted in October of 1981 by the President. It was not approved at that time. We had congressional requests to develop other modes. The Scowcroft Commission recommended that we go back to this one and that is exactly what we are doing.

We have no plans to submit any different mode than the one that is before you.

Senator NUNN. So for the purpose of this debate, we can assume this is the basing mode and there is not anything in the offing that would change that for at least the first 100?

Secretary WEINBERGER. Not unless Congress changes it, no, sir.

Senator NUNN. Thank you.

Chairman GOLDWATER. Senator Thurmond?

Senator THURMOND. Thank you, Mr. Chairman. Mr. Chairman, I would like to join in welcoming Secretary Shultz and Secretary Weinberger.

And I want to say, Mr. Chairman, I fully agree with your remarks about the Congress carefully weighing the effects of congressionally mandated unilateral actions, such as funding reductions and moratoria, on our arms control negotiations.

It is important to note as we review the relationship of strategic modernization to the arms control process that the U.S. Congress here in Washington very nearly gave the Soviets what their most skilled negotiators in Geneva could never exact. That is, unilateral cancellation of a strategic program without any concessions from the Soviet Union.

It is very unwise and even dangerous to force the President of the United States to conduct two sets of negotiations, one with the Congress and one with the Soviets, when our adversary faces no similar situation.

Gentlemen, I have very few questions here. As a result of verified Soviet violations of important arms control agreements, have the Departments of Defense and State generated any concrete policy proposals designed to enforce Soviet compliance with existing or future arms control agreements?

Secretary WEINBERGER. Senator, as far as concrete proposals to enforce those treaty provisions or force the Soviets to carry out their previous agreements, the answer regretfully has to be no. There is no international procedure for forcing a state that violates its agreements, as the Soviets have, for redressing that or correcting that behavior.

It does, however, underline the importance of verification in any new agreements that we try to make with them. When you have that kind of a record, it makes it all the more vital that the treaties be verifiable so that new promises can be given new credence. But there is no way that we have developed, in international law or otherwise, of forcing a state that violates its promises to keep them.

Senator THURMOND. Secretary Shultz, in view of our apparent inability to resolve issues of Soviet non-compliance through the existing apparatus, have you devised any alternative means to resolve future non-compliance issues?

Secretary SHULTZ. It seems to me that the road to answering that question is clear. First are the comments that Secretary Weinberger just made, to try to develop agreements that are as clear as they can be under the circumstances and where we can see means of verifying whether or not the things agreed to are carried out.

Second, having identified violations or ambiguities, to discuss those with the Soviet Union, as we do in private, and to say in public what we believe the case to be.

Third, it seems to me we have to always be looking at our hole card: What is our ability to defend our values and interests and our ideals? What kind of a strategic posture are we in? That is the fundamental way in which, it seems to me, you have to deal with an adversary that is a dedicated adversary and is ready to take full advantage of whatever opportunity you give him.

And finally, I think that the type of negotiation we foresee in Geneva offers us a potential opportunity to do something other than identify violations and object to them, and that is to take up, for example, the question of the regime envisaged by the ABM Treaty and to raise questions about what we believe are problems in that connection—I talked about it a minute ago—and in effect to have a discussion in the sense of what is to be done about these developments to try to bring the regime more in line with what it seemed was intended in 1972 in the first place.

So those are the sorts of things, it seems to me, we should be doing.

Senator THURMOND. Thank you.

Secretary Weinberger, some have argued that the MX capabilities to deny the Soviets a sanctuary for their ICBM's in silos will

become increasingly less important because new generations of Soviet ICBM's will be deployed in mobile basing modes. In your judgment, will silo-based ICBM's continue to be an important factor in the Soviet force structure?

Secretary WEINBERGER. Yes, sir, I think they will. The newest missiles they are developing we believe have a mobile capability, but the great bulk of their missile strength and force right now is silo-based.

The MX would also have some capabilities against even mobile systems, but I think it will be perhaps some time before there would be any major shift to the mobile systems that they are now testing.

Senator THURMOND. Last year the Congress considered a number of unilateral actions, such as testing and deployment moratoria, and some of these actions became law. In your judgment, what would be the effect of similar actions this year relative to our ability to negotiate effectively in Geneva?

Secretary WEINBERGER. Senator, I think if there is any hesitancy or any opening furnished the Soviets in which they thought that there would be less than the full program of the MX voted and that there would be further delays and further debates over restoring our deterrent capability, that it would lead inevitably to their unwillingness to negotiate anything like the kind of sharp and verifiable reductions down to parity that we seek.

It is only logical that if they feel they can accomplish what they want without giving up anything, that they would be very glad to wait out our negotiators and to wait and see if there are not further delays, further weakening, further qualifications to our proceeding with the MX strengthening that, as I said, we have now been debating for 12 years.

Senator THURMOND. Secretary Weinberger, I just have one more question. Your Under Secretary for Policy, Dr. Ikle, wrote a prophetic article 24 years ago. It was entitled "After Detection, What?" and dealt with responses to violations of Soviet Union agreements.

Dr. Ikle advocated restorative measures to redress any imbalance created by cheating. What actions would be necessary by the Department of Defense to restore the military imbalance created by Soviet arms control violations?

Secretary WEINBERGER. Well, sir, the SDI work, the strategic defense that the administration has underway, is for much broader purposes than you have indicated, but it certainly is necessary, among other things, because the Soviets are not only doing research which they are doing, but they have started, as Secretary Shultz indicated, with the construction of the Krasnoyarsk radar, of course, which is clearly violative of the ABM Treaty. And our strategic defense research that I hope will lead to a program is one of the responses that we make.

When they get out of balance, when they violate in other ways the treaties, then, as Dr. Ikle said in the article you quoted, it is necessary for us to take the necessary steps to preserve the strength and the credibility of our deterrent.

Senator THURMOND. Thank you.

Thank you, Mr. Chairman.

Chairman GOLDWATER. Senator Stennis?

Senator STENNIS. Mr. Chairman and gentlemen: I commend the Chairman for having this hearing and to you gentlemen for coming to testify. I think it is very timely, very timely, that you two men would tell the American people exactly what you see regarding these developments.

Now, there are some of us here on this committee, that for at least 10 years have been voting on this very question of the MX. I have voted right straight down the line in favor of it, and I am not announcing anything to the contrary.

But I have decided that if there was anything near the need portrayed to us in the beginning that this would have been a crash-landing program. I remember when we had the moon shot program. I had a place on the authorizing subcommittee and ran to see what I was supposed to do, and they said: Well, you do nothing; this is a crash-landing program. And it went through.

I have begun to have serious doubts about the wisdom in view of the present situation of continuing this effort, when we did not move forward and make real progress the last time we reconsidered the basing mode. At one time our committee was almost all for it, disagreed on the basing mode some, but gave it every support in the world.

I do not want to cast doubt. I want to cast affirmative beliefs. But to meet any needs and we have other needs, too—we have got to meet—may run into many billions of dollars.

I just thought I ought to express myself to that extent anyway.

I have nothing detailed to ask. There are others that specialize in these studies that have asked many questions, and additional ones will come. But this is getting to be a mighty serious matter. I voted for it a time or two, just as a matter of backing up the Chief Executive, whomever he was.

But this thing has moved on to another dimension now, and I am doubtful, as I said, about going back and spending good hard money that is so needed further on this particular project.

Mr. Chairman, I especially thank these two gentlemen for the splendid work they are doing in this highly important field and very difficult field. I know the subject well enough to know that.

Thank you.

Chairman GOLDWATER. Senator Warner?

Senator WARNER. Secretary Shultz, it is acknowledged that one of the reasons the Soviets are returning to the negotiating table is indeed the SDI Program. To what extent will that program be discussed in these talks?

And I ask the question because it impacts on the decision facing the Congress now; namely, the level to which we fund the President's request.

Secretary SHULTZ. As you know, Senator, in Geneva the negotiations will take place in three different groups. And one of the groups will discuss, in the Soviet parlance, space; and in ours, defense.

So we are more or less agreed between us. Undoubtedly, the question of what may be done in space for defensive purposes will be talked about, and we have said we are quite prepared to discuss the implications of possible outcomes of a research program, and

this is essentially conceptual because you can't talk about it in actual operational terms until you know what it is you are talking about.

And we have also pointed to provisions in the ABM Treaty that have been brought out through Senator Nunn's questions here again, and said that if we do find a means of defense against strategic ballistic missiles, then we are prepared to discuss the question as called for under the ABM Treaty of how this might be introduced.

What we have in mind is a gradual shift from what we have now—an essentially totally offensive-based means of deterrence—to one that has a greater measure, then perhaps eventually a total center of gravity based on defense. But that remains to be seen.

The answer is yes, we will discuss SDI.

Senator WARNER. So, in summary, the search will go further and that is not up for negotiation but it is that turning point which is indecisive now because it's not stated. There is no data base, but you characterize it as the outcome of a data base of basic research. At that time we have flexibility both with respect to the treaty and what we might or might not do with respect to future testing and deployment?

Secretary SHULTZ. Yes, sir. On the point of research, Mr. Gromyko and I discussed that, in Geneva, and we agreed that we couldn't conceive of any possible agreement, even if we desired to make one about research that was in the remotest sense verifiable.

I think that constitutes an agreement that we shouldn't try to develop an understanding about research, or at least that's my view.

Senator WARNER. Now, should the Congress fail to fully fund the President's request, would you say that that would have a negative impact on the U.S. position in these talks?

Secretary SHULTZ. Without the slightest doubt.

Senator WARNER. Secretary Weinberger, following your testimony this morning, at the very end, although it it is not in your written submission, at the very end you talked about this committee having received yesterday a targeting briefing.

And I want to try and carefully phrase this question to in no way compromise classified information, but many of us have had the briefing or variations of it for a number of years. And as we look at the briefing against the discussions by the leadership in this country and worldwide as to the relative posture of the Soviet Union and the United States today in terms of nuclear weapons, we use the term rough parity, rough equivalence. And the general public, both here and abroad, are given the impression that in terms of numbers of warheads or launchers, give or take a few numbers, we have this rough equivalence.

But when you inject the targeting, it seems to me that rough equivalence or parity does not hold up. You have a considerable disparity between the United States; namely, you have a much larger land mass in the Soviet Union, giving rise to a disparity in the number of targets. You have a hardness issue; you have a dispersal issue; and now you see a move toward mobility.

My question is: In seeking support, both at home and abroad for the MX system and for SDI, why doesn't the administration begin

to reveal more of this story in terms of the application of the targeting doctrine and not leave the impression that there indeed is a rough equivalence or parity?

Secretary WEINBERGER. Well, there isn't a rough equivalence or parity, Senator. And as far as what we can and cannot discuss in open hearings, we are, of course, and should be bound by the intelligence community's decisions, since they are the ones who gather and disseminate the intelligence that can be used.

I would say, however, that you indicated a couple of areas where the Soviets have, because of the defenses that they have employed, and frequently we are told when discussing strategic defense, that defensive philosophy is one that we all abandoned, and that is clearly not the case with the Soviets. They spend at least as much, if not more, on defense than they do on offense, although they spend a great deal on both.

But they have hardened their targets, they have protected their command and control centers, and they have in every way made it essential if we are to maintain deterrence, that we get a more accurate missile with a greater opportunity to deal with the targets that they have.

We did yesterday, and I can go in later if you wish in closed session in much more detail about this, but the fact is it is not enough in measuring a deterrence or in casting up these equations of deterrence, it's not enough just to say they have so many warheads and we have so many warheads.

You have to look, as you know, at the delivery systems; you have to look at the yield, at the accuracy, and the ability to deal with targets that are essential as far as their continued offensive aggressive capabilities are concerned, and on all of these measures and by all of these standards. And as you heard yesterday, it is essential that we modernize and secure the much more capable MX Peacekeeper capability than we have now.

And we have been reporting the necessity of that; a number of administrations have for the last 12 years. The Soviets have not waited. They are one full generation ahead in deployment by many years and they are working, as we have heard, on the next.

It is this, though, the numbers of raw warheads that you count, that indicates the erosion of deterrence.

Senator WARNER. That's the point I wish to make. I think we should dwell more on that. As your chart showed and as you look at the other factors, there is a steady erosion of our deterrent capability. And indeed, if you bring in MX and Trident II and the B–1, it seems to me that you are not going to close that gap.

Secretary WEINBERGER. Well, Senator, we are not trying for force superiority. What we are trying to do is to maintain a capable and a credible and an effective deterrent, and it is a very difficult thing to test, because what you try to do is get inside the Soviet mind.

We are not talking about what would deter us. We are talking about what would deter them, and they have to know that even after a first strike, they would be faced with a retaliatory capability, surviving capability, that would inflict on them damage that they would find unacceptably high. And it is essential if we are going to do that, that we maintain the kind of deterrent, the kind of offensive capability, if you like, that can do that, can deter war.

Now, we have managed to do it for a very long time, and I was very interested in Senator Stennis' remarks because he made the point that this had been presented in the past as a crash program, and indeed I think the people in the past over the years who presented it felt exactly that way, as we do.

The fact that deterrence hasn't failed doesn't necessarily mean that you have an adequate deterrent. You are very hopeful that you will always be able to have exactly that; the equations are difficult to cast and the computation of what will deter the Soviets is not all that exact a science.

But we do know that as we get into maintaining a missile system that has neither the accuracy nor the yield nor the abilities to destroy enough of their targets, should they launch an attack, that your deterrent erodes. And at what point it becomes no longer critical is a point you do not want to explore very closely.

Senator WARNER. That was the point I was endeavoring to make.

My last question is to Secretary Shultz, and that is the question of the allies. Secretary Weinberger made a recent trip in an effort to try to dispel concern on SDI. My specific question: Do you plan any more formalized briefing of the allies as a group with respect to our posture on SDI?

Secretary SHULTZ. We keep our allies posted on what we are doing and we listen to their views practically continuously through meetings in Brussels with the chiefs of mission there, in the NATO setting, through direct meetings with heads of state when they come here, and by visits to them in their own capitals. We sometimes have general discussions about this subject, but also have explicit briefings on what is taking place.

As an example, when we completed our negotiation in Geneva in January, our team in Geneva dispersed, literally, all over the world to give direct reports to our allies by people who were on the scene. I think that was very much appreciated, and it is the sort of thing that we intend to continue, and which I think helps build the strength and unity of the allies that we see right now.

Senator WARNER. My time is up, Mr. Chairman.

Chairman GOLDWATER. Senator Hart?

Senator HART. Secretary Shultz, in your prepared statement on page 6, I would like to read two sentences that are almost back to back at the middle of page 6: "The Soviets must realize that it is in their interest as much as ours to seek ways to reduce nuclear arsenals and the dangers of war."

And then, one sentence down, you say: "These new weapons," referring to the strategic modernization program, "are not bargaining chips. They are part of the very strength upon which real bargaining rests."

What are we prepared to bargain with, since the Strategic Modernization Program virtually covers the entire triad? And if I understand, what you are saying is there are no weapons in our arsenal that we are prepared to bargain away, and yet it is the goal of the administration, as you say, to seek ways to reduce nuclear arsenals.

What is it we are prepared to bargain with, then?

Secretary SHULTZ. The idea of identifying a particular program that we are discussing here in this country and that Congress is

considering and saying that that particular program is being carried out in order to create a bargaining chip which we can then take away is a concept that I was rejecting in my testimony; and saying, rather, that we need to be doing the things across the board that we think are in our interests and that we think add to deterrence. This in turn generates the strength we need to bargain effectively at the table.

It seems obvious to me, that if we are going to be successful in persuading the Soviet Union to do what at least rhetorically they said they wanted to do in Geneva, namely, have radical reductions in nuclear offensive armaments, we are going to have to be talking about the whole spectrum of our programs and their programs.

Senator HART. So, on the one hand, you are saying that the Strategic Modernization Program is not negotiable, but on the other hand it is?

Secretary SHULTZ. I didn't say that it is not negotiable, but I said it shouldn't be thought of as programs that you develop simply for the sake of creating a bargaining chip. You should develop them because they contribute to our deterrent posture.

And clearly, when you meet somebody across the bargaining table, they have things they want from you, and you have things that you want from them. And the definition of a deal from our standpoint, of course, has to be that we think we are better off because of it. I think you have to know that you are not going to get a bargain with somebody else unless they think they are getting one, too; that is, that it is in their interest as well as yours.

Otherwise, they won't bargain with you. You have to have something with which to bargain.

Senator HART. Precisely. So there is no romantic notion in the administration that we can get sharp reductions on the Soviet side without some willingness to undertake those same reductions on our side.

Secretary SHULTZ. We have to give and take.

Senator HART. Secretary Shultz, the administration—at least the key members of the administration from the President down—came into office, sharply critical of the SALT II Treaty, on the grounds that it was not real arms control; it didn't bring about those sharp reductions.

What, in summary, is the argument then for continuing to abide by its terms? Under what conditions does the administration intend to continue to abide by the treaty, and in what time frame?

Secretary SHULTZ. I think the arguments are twofold. One, imperfect as it is, it provides some limitations or structure; and the other is that in avoiding movement to what you might call an unconstrained world, a totally unconstrained world, you may create a somewhat better atmosphere for having ongoing negotiations.

On the other hand, a "no undercut" policy has to be based on an understanding that they also will not undercut what has been agreed on. And so the pattern of violations constitutes a problem in that regard. And the President's posture, as I understand it right now is that we do have a "no undercut" policy in effect, but we reserve the right in a sense to review our options as the year progresses and as we may confront situations where there is a cutting edge, a particular cutting edge to that policy.

Senator HART. Philosophically, if we were able at the bargaining table or elsewhere, to convince the Soviets to refrain from doing the things that have alleged to be violations of that treaty, that is, get them to assume a "no undercut" policy, would you then advocate within the administration and to the President that we continue to pursue a "no undercut" policy?

Secretary SHULTZ. Well, I think it is not so much a question or just a question of what somebody agrees with, but what do they do and what we observe. That is what is troubling people. It is behavior, not rhetoric, that counts.

Senator HART. My question assumes the Soviets change their behavior.

Secretary SHULTZ. Then sure.

Senator HART. Finally, to either Secretary Shultz or Secretary Weinberger, could you discuss the philosophy of pursuing modernization and expansion of the strategic arsenal at a time when we are also pursuing a course which we hope will lead to sharp reductions through the establishment of defensive capabilities?

In other words, isn't the modernization program antithetical to the SDI?

Secretary SHULTZ. Why don't I take a crack at that, and then you straighten me out, Cap, if I say anything wrong.

I think the word you should underline is "modernization." It is not buildup so much as the avoidance of becoming obsolete by relying on things that aren't anywhere near as good as what you could replace them with. So actually, the history of the number of weapons that we have is one of decline, but presumably they are better weapons if they are more capable.

It isn't a question of building up, but rather of modernizing.

Now, as far as traditional defense against ballistic missiles is concerned, that is something that we more or less gave up on some years ago in thinking that it could not be effective. But with the technology that we are investigating today, there is the possibility that it could be effective. And if it is, then it offers us the possibility of a different kind of doctrine of deterrence and a doctrine that I think has a lot more comfort in it than the present one, although it is important to emphasize—and I underline the word "emphasize"—that deterrence based on offensive capability has got to be the name of the game in the years we see immediately ahead, and we have to emphasize that and continue to rely on it.

Secretary WEINBERGER. We don't have the strategic defense initiative now. We do have a triad of strategic offensive systems that needs modernization, and it is quite dangerous to keep setting aside the modernization task in the hope that something else may develop so that it won't be needed.

It is like saying, well, we hope to get a single-headed missile in the 1990's, so we won't do anything now. The Soviets have never indulged in that practice. We put on the chart twice now the developments that they have brought forth and deployed while we have been debating. And it is essential that we regain a modernized deterrent capability with offensive systems while we are trying our very best to develop a system of strategic defense.

And if we can, and I hope we can, then we would have, as Secretary Shultz has said, I think a better system and a better method

of keeping the peace. But you can't keep the peace, you can't keep your deterrent on the basis of unfulfilled hopes.

Senator HART. Do you have any idea, Secretary Weinberger, when this research will produce enough data to determine whether or not development and deployment of the SDI are possible?

Secretary WEINBERGER. No; I think that is a very hard thing to try to guess at. We do have an extensive program, as you know. We are extremely well pleased with the results so far. And I think you have had—and we certainly can arrange if you haven't had—briefings from General Abrahamson who is in charge of the program.

But, just for example, we are able to do a couple of things, we believe this coming year, that we did not think would be ready for 2 more years. So we are making good progress on it, but we don't have anything like the ability of a predicted date when we can give the answer to your question.

Senator HART. Thank you, Mr. Chairman.

Chairman GOLDWATER. Senator Denton has to assume the duties of the Chair at 10:50 and Senator Humphrey has very graciously allowed his time——

Senator HUMPHREY. Not all that graciously.

Chairman GOLDWATER. We will get to you.

Senator DENTON. I thank you, Mr. Chairman and Senator Humphrey, Senator East, and Senator Wilson. I don't have any other choice; I won't be able to participate unless I go at this time.

Mr. Secretaries, I am concerned that many in Congress and in our public do not understand the obvious significance of the present state of affairs in the strategic balance and in arms control. Without that understanding, there cannot be congressional or public support for realistic policy initiatives proposed by the administration.

In that regard, I intend to ask you both seven questions which I hope you can answer yes or no.

The seventh question you can answer in words beyond yes or no, and if you don't feel like saying yes or no, say maybe some other word, but I would like to get these all in one group.

Gentlemen, would you agree that the Soviet Union has developed its strategic conventional and nuclear offensive and defensive forces by a massive infusion of resources and by stretching to the limit and in some cases exceeding the provisions of arms control agreements currently in effect?

Secretary WEINBERGER. Yes.

Senator DENTON. Would you agree that whether or not any single Soviet activity has been in violation of existing agreements, that the total effect has been to exploit every possible advantage contained in the agreements themselves as well as in the means for their verification and enforcement?

Secretary WEINBERGER. Yes, sir.

Senator DENTON. Do you believe that, since the Soviet Union has pushed to the limit in every possible category strategic offensive and defensive systems, it is virtually at the point where it would be able to undertake a massive expansion of all categories simultaneously, breaking out, not just from the constraints of any one treaty or limitation, but from most or all possible constraints simultaneously across the range of offensive and defensive systems?

Secretary WEINBERGER. Senator, on that one, I would say that they are doing a great deal of research on the equivalent of strategic defense. We don't know whether they are ready to have any kind of a breakout of the ABM Treaty at this point, but it is because they are and have been actively engaged in research in that area, that is one of the reasons why we feel that we should pursue, as the President has stated it——

Senator DENTON. I understand. My question related to a position from which they would be able to undertake a breakout. I didn't ask whether they intended to do so.

Secretary WEINBERGER. They have a very large base, a very large, modern foundation of offensive systems and a lot of research on strategic defense. I personally don't know whether they are ready to break out or not, but they are able to devote immense resources in any given year or in a number of given years, as they have always done, to this activity.

Senator DENTON. I don't think they are ready to break out yet.

My next question refers to the timeframe in which they might be able to break out.

Does this situation mean that the Soviets could, dangerously faster than the United States, achieve a critical advantage in terms of the nuclear balance which is of urgent significance to our security both in their ability to attack us and in our ability to retaliate effectively against the assets that they hold most dear?

Secretary WEINBERGER. Yes; they can expand a great deal more rapidly and with a lot less discussion than we can, and indeed they have over the years. And they start from a higher base.

So I would want that as my answer to your question.

Senator DENTON. Yes, sir, if they do undertake that breakout in a whole range of strategic systems, as you mentioned they could do it faster than we, considering the present dispositions. Should they undertake that breakout, would the United States be able to nullify or eliminate the Soviet advantage by any change in the production or disposition of our own systems?

In other words, would we have the capability to respond quickly enough to restore our security by the production and/or deployment of hardware capable of performing appropriate offensive and defensive functions?

Secretary WEINBERGER. Senator, that is a very key question and the answer has to be a little bit more than yes or no. The problem is that it takes a very long time to develop these new systems.

The MX Peacekeeper we have been debating for 12 years. We are able to go into production. We have started on production, but it has taken us a long time to get there. And it is not possible to make up deficiencies of the kind you indicated in your question, should they develop, overnight.

It takes quite a long time and, more than that, it takes, as Secretary Shultz said, a national will and resolution that persists for the length of time that is necessary to achieve that equivalence. And that is such a very difficult thing in our type of society, but also that is what is so very dangerous about letting one side get in any sense any imbalance in deterrent equations.

Senator DENTON. And I would comment that perhaps the world press and some in Congress here are not stressing enough that

when the United States did have a nuclear monopoly and a first strike capability, for at least a decade, we never used it. The question posed the other way, is would the Soviets have acted the same way, refraining from intimidation or use, I think it is a good question. Here is my last question.

It is evident that world opinion has no deterrent effect, no effective deterrent effect on Soviet violations of strategic arms limitations and other treaties or on further violations of international norms and obligations such as Korea, 1950; Hungary, 1956; Cuba, 1962; Czechoslovakia in 1968; Southeast Asia, ongoing; Afghanistan, ongoing; the Korean airline incident of 1983; and Central America, ongoing.

In that situation, and on a broader basis, what can the United States do other than produce the MX to develop an inhibition similar to that which existed to some degree under the League of Nations and earlier on in the life of the United Nations during a time in which the Soviets were at least trying to disguise aggression such as in Korea and Vietnam?

Afghanistan was a naked aggression, a return to the law of the jungle. What is going on in Central America, Southeast Asia, and the Mideast all to a relative degree are not as severe compared to what we had from 1945 to 1967, roughly. What basic policy aims do you have other than, say, the MX and things like that, to produce an inhibition?

Secretary WEINBERGER. Well, Senator, you have put on and underlined very clearly and starkly the whole rationale for deterrence. We have to have this kind of ability to deter attack in the face of behavior of the kind that you have outlined and stated.

We also hope that ultimately we will get a system that will render impotent and useless their nuclear intercontinental and intermediate range missiles, and that that will produce a greater degree of safety. But the most dangerous thing to do is to do what we have been doing, and that is to discuss without taking any of the steps necessary to maintain the deterrent capability we have to have in this kind of world.

Secretary SHULTZ. May I comment on that question, Mr. Chairman? That wasn't asked of me.

Senator DENTON. You were both asked those questions, Secretary Shultz, I am sorry. That is not a yes or no question I just asked.

Secretary SHULTZ. I agree with Secretary Weinberger that strength has got to be the basic name of the game. On the other hand, I think it is a mistake to have your thinking about the United States-Soviet or East-West relationship be confined to essentially military thinking or security-oriented thinking, and when you expand it out beyond that, I think that we are on a roll.

The idea that forms of government that are more responsive to the people being governed than a totalitarian type regime is gaining strength everywhere in the world. The example of economic progress as societies are more open and as economies are more open is gaining strength everywhere in the world, and these developments put the Soviet system ideologically very much on the defensive.

The Soviets used to get a lot of mileage out of the idea that somehow or other whatever else you may do or say the socialist view

was the wave of the future, and that is no longer the case. I think people are increasingly aware that a more democratic, more open way is the wave of the future.

Senator DENTON. I agree with you, Mr. Secretary.

Secretary SHULTZ. And that is supported by different kinds of technologies than we are even discussing here. I think one of the most important technological developments going on in the world is the revolution in information technology which poses to a closed society a choice that is a terrible dilemma for them.

If they deny the technology, they are fated to fall further and further behind the times, and if they accept it, they are inevitably going to have distributed to their population factual material and lines of argument that they have been able to shield their population from over a long period of time.

So, I think that we have to maintain a strong defense posture, and that is the real deterrent. On the other hand, looking at your question more broadly, I think we can feel that if we retain our will power and our nerve, that we are very much—our ideas and the ideas of our friends and allies around the world—on the ascendent.

Senator DENTON. I agree with you, sir. I would not be here trying to serve in the Senate if I did not.

Senator GOLDWATER. Senator Levin?

Senator LEVIN. Thank you, Mr. Chairman, and welcome, Secretary Weinberger, and Secretary Shultz, I have not had a chance to see you since your great success in Geneva, Mr. Secretary, and I congratulate you for it. We are all very much in your debt. The entire world is in your debt for what you achieved there.

I have some questions for you relating to SDI and the relationship between SDI and the ABM Treaty. To start off with, would deployment of SDI require a modification of the ABM Treaty?

Secretary SHULTZ. Yes.

Senator LEVIN. And have we informed our allies that if research shows that SDI is feasible, that we would negotiate with the Soviets whether to deploy it before we deploy it?

Secretary SHULTZ. What we have said consistently that we will abide by the terms of the ABM Treaty, and that calls for discussions and so on, and we intend fully to abide by those provisions.

Aside from a strict discussion of treaty provisions and so forth, it seems to us that it makes sense if you find a way to deal effectively or reasonably effectively with ballistic missiles from a defensive standpoint, to envisage over a period of time a gradual shift in doctrine that allows for a greater element of defense in it. This is particularly relevant in light of the sort of things that were brought out in the questioning of Secretary Weinberger—the mobility of offensive systems and thereby the difficulty of verification or dealing with them.

I think that the emergence of defense technologies offers us the real hope for the future, so we want to talk about that with them and our allies.

Senator LEVIN. I can understand why we want to talk to them about it, but I want to make sure I understand both Prime Minister Thatcher and our President correctly. Is it our intention to ne-

gotiate, and I use that word specifically, is it our intention to negotiate with the Soviets prior to deployment of an SDI system?

Secretary SHULTZ. If we have a result, let us say, that is potentially operational, we have said that we will discuss that with them, and we will try even before we know whether we have something operational to discuss the concept, and its implications, to try to get them to accept our concept. They reject it now, as you know.

Senator LEVIN. You used the word "discuss," which is a word which has a different meaning from "negotiate"?

Secretary SHULTZ. If what you are seeking is an administration commitment never to do anything in this field unless the Soviet Union agrees to it, I don't think it would be wise to make that commitment.

Senator LEVIN. What I am seeking is some clarification. We have told our allies that we are going to negotiate the system prior to deployment. At least that is what Mrs. Thatcher said that the President agreed to when she issued a four-point statement back in December.

Secretary SHULTZ. That was a joint statement that came out of a discussion that Prime Minister Thatcher and President Reagan had at Camp David.

Senator LEVIN. So that was agreed to by the President?

Secretary SHULTZ. Yes.

Senator LEVIN. Well, those words are, "The SDI related deployments would in view of treaty obligations have to be a matter of negotiation."

Secretary SHULTZ. Yes, of course.

Senator LEVIN. So you don't draw a distinction between the words "negotiations" and "discussions"? They have to be a matter of negotiations, right?

Secretary SHULTZ. If they are to be deployed, then the provisions of the treaty would have to be changed, so you have to negotiate about that.

Senator LEVIN. All right, that is fine. So we would have to negotiate a modification in the ABM Treaty prior to any deployment?

Secretary SHULTZ. We would negotiate with them about that subject, but I said to you a minute ago that I think it is not wise for us to get ourselves in the position of saying that we would never do anything unless the Soviet Union agrees to it.

Senator LEVIN. My question, though, is, and Congress is being asked to appropriate some significant money for research, and the level of research dollars is important, and what the assumptions are is important, and I want to ask you the question again because I think it is a critical question.

Does the ABM Treaty require us to negotiate a modification in it prior to deployment of any SDI system?

Secretary SHULTZ. Of course, we do not know what the research may produce, but I think of the kinds of things that are being discussed that almost surely the ABM Treaty would have to be changed if they were to fall within its scope, and the treaty contains provisions under which changes in it can be negotiated, and we would try to negotiate them.

Senator LEVIN. So the only way to obtain the changes, though, in that treaty would be through negotiation? I would like Secretary

Shultz to answer that question. Is the only way to negotiate changes in the treaty through negotiation?

Secretary SHULTZ. That is true of any contract.

Senator LEVIN. All right. Now, next question. Do you agree with Secretary Weinberger, and then if I have time left I want to ask him perhaps to expand on this, but Secretary Weinberger made the following statement, I believe, to the Foreign Relations Committee.

He was asked by Senator Pressler, "Why would the Soviets be so concerned about SDI?" And his answer, as this first draft, I guess, of the transcript, assuming it is accurate, says, "It is something that leads me to confirm the feeling that I have that it is a vital thing for us to have."

And my question of you is, does the fact that the Soviets oppose space weapon deployments by both sides, presumably, automatically mean that we should be for it? Is that evidence that it is good if the Soviets think it is bad?

Secretary SHULTZ. Of course not, but the fact that they have placed so much emphasis on it leads one to conclude that its existence and their desire to deal with it somehow is one of the reasons why they have come back to negotiations. I don't say unequivocally that is the reason because we do not know. We are not inside the Kremlin. We do not know exactly what motivates them. But they have certainly talked enough about it to suggest that.

Beyond that, however, as Secretary Weinberger pointed out a minute ago, they have done a great deal more work on the subject of defense than we have. They have deployed all the antiballistic missiles that exist today.

They have also engaged in some antiballistic missile related activity that we believe is in violation or probable violation of the ABM Treaty, and some of which give cause for concern that they may be preparing for a future territorial defense. For years they have been engaged in research along lines that we think of as the research being sponsored by SDI.

In fact, they have had some of their scientists go around ours and say, you know, why do you want to follow this line of research? We have already been down that path, and it is a dead end. And so even that makes you scratch your head. Maybe they do not want us to do this because they are ahead, and they do know some things that they hope we do not find out.

We do not know the answer to that, but we do know it is a very important subject, and basically if it turns out to be genuinely productive, it seems to me it offers the possibility of a much better pattern of deterrence than what we have now.

Senator LEVIN. My time is up. Mr. Chairman, will the record be kept open for additional questions to both the gentlemen?

Chairman GOLDWATER. Oh, certainly.

Senator Humphrey?

Senator HUMPHREY. Thank you, Mr. Chairman.

Secretary Shultz, I want to explore the role of linkage in these arms talks. To what extent is the requirement that the Soviets withdraw from Afghanistan a requisite of our signing an agreement with the Soviets in Geneva.

Secretary SHULTZ. Well, I think that it is. No excuse can be offered for their invasion of Afghanistan and their continued brutal

suppression of the people of Afghanistan, and we should have no hesitation in saying that and trying to rally world opinion on that subject, and giving support to Afghan refugees. It certainly affects, I think, and should, our security assistance program to Pakistan and perhaps other things as well.

Beyond that, we support the United Nations efforts to try to bring about a negotiated withdrawal of the Soviet Union from Afghanistan. All of those things, I think, are things we should work on, as are many other aspects of the U.S.-Soviet relationship where we identify matters that are totally unacceptable to us.

I am thinking in particular of many violations as we see it of the Helsinki Accords insofar as their attitude toward emigration, insofar as the way they treat many people inside the Soviet Union. There are many outrages. The shooting down of the Korean airlines was an outrage.

At the same time, I believe that if we identify something that we feel is very much in our interest to do, we should certainly consider doing it. And I think it was an expression of a different concept of how to deal with the Soviet Union when President Reagan led and helped to develop the world reaction to the Soviet shooting down of the Korean airliner and the way they handled it afterward, and in that very setting sent our arms negotiators back to Geneva to talk about INF and START.

Senator HUMPHREY. You used the phrase "totally unacceptable." Does that apply to the Soviet invasion and occupation and brutalization of Afghanistan?

Secretary SHULTZ. That is what I applied it to, I think, or I certainly will.

Senator HUMPHREY. Did you not then say, following in the same breath or next breath, they are willing to go forward with negotiations and presumably sign an agreement with the Soviets in Geneva even if they continue to occupy Afghanistan?

Secretary SHULTZ. I believe it is a mistake for us to decline to do things if there is something that we think is very much in our interest, but I think we have to take things like Afghanistan, Cambodia, Nicaragua, all of these transgressions of the Soviet Union into account, and we have to be ready to contest those things on their own terms.

The thing we shouldn't allow is a kind of reverse linkage in which somebody says, for the sake of our good relationship with the Soviet Union or possible progress on arms control, that we should ignore transgressions. We should not.

Senator HUMPHREY. Are you saying that the Geneva talks and a possible agreement are in a completely separate sphere from the totally unacceptable behavior, as you term it, of the Soviets in Afghanistan? They are two separate issues, and there is no linkage?

Secretary SHULTZ. No; I did not say that at all.

Senator HUMPHREY. Is then the withdrawal from Afghanistan a requisite to the signing of the agreement?

Secretary SHULTZ. It is not that black and white.

Senator HUMPHREY. I am simply trying to establish the position of the administration on this important issue.

Secretary SHULTZ. Well, I tried to explain it to you.

Senator HUMPHREY. I think you are hedging, I say with all respect.

Secretary SHULTZ. No, I am not hedging. I am saying that it is a mistake to get yourself in a position where everything in the world hangs on one thing, for example, Afghanistan.

Senator HUMPHREY. Well, if indeed the Soviet brutalization of Afghanistan is totally unacceptable, then that should be a matter of linkage with respect to reaching an agreement with the Soviets. If that is not the case, then we shouldn't say totally unacceptable. We should be straightforward in our rhetoric and in our actions.

Mr. Secretary, I know you are very busy, as we all are, and do not have time to read all that you might like, but I wonder if you have had a chance to review the report recently issued by the private, nonpartisan organization called Helsinki Watch, which details the atrocities committed by the Soviet Union on the people of Afghanistan. Have you had a chance to review that?

Secretary SHULTZ. I have not read that document, but I do not have any doubt regarding Soviet activities there. I have read enough things about what is going on in Afghanistan to find it completely repulsive.

Senator HUMPHREY. It is indeed. For instance, the report details the rounding up of men in a village, tying them, stacking them like cord wood, pouring gasoline on them, and burning them, the herding of women and children into rooms and hand grenading them, the carpet bombing of villages, and just yesterday the Task Force on Afghanistan, which I chair, held a hearing of nearly 4 hours' duration during which it was established pretty conclusively by outside experts, including our representative from Helsinki Watch and also another from Freedom House, that the Soviets are engaged in a deliberate policy of starvation, that they are poisoning wells, poisoning graineries, burning crops, shooting livestock, and in every conceivable means bringing the people of Afghanistan into subjugation through starvation and terror, and that is behavior which is unspeakable, it is beastial, it is uncivilized, it is savage, it is even criminal in the literal sense of the word, and I find it difficult to see how our Government, and you talked a moment ago in speaking with another member about your optimism that free governments are gaining strength everywhere.

Well, I would like to share that optimism, but it is not happening in Afghanistan. Our Government is not giving that issue nearly enough attention. We are not raising the level of outrage in this world with respect to the Nazi-like atrocities of the Soviet Union, and meanwhile we sit down with them and talk about linkage which does not exist in fact.

Secretary SHULTZ. Senator, I reject your comments. I believe you are wrong. I think we have expressed ourselves. We have rallied others, and we have done things that are completely consistent with our view of Soviet behavior in Afghanistan. Not only that, Soviet behavior in Cambodia. Not only that, Soviet behavior in Nicaragua. Not only that, Soviet treatment of individuals in the Soviet Union.

All of these things and many others we should have in our minds all the time, and we should never hesitate to speak about them, including speaking about them directly to the Soviet leadership. But

if what you are leading to is the notion that we should in our outrage decline to have any relationship with the Soviet Union, if you are telling me I am committing a crime by going to Geneva to sit down with Gromyko, I reject that.

I think that we need to put the pressure on as best we can, subject by subject by subject across the board, without hesitation, but I also feel that if in this era of vast nuclear armaments, which do become more and more menacing and more difficult, we refuse to even discuss that subject and try to work out an agreement for reductions that we think would be in our interests, that is foolish.

So, I believe the President was right in sending our negotiators back to Geneva even in the midst of the Korean airline atrocity, where as I would take it you think he was wrong to do that.

Senator HUMPHREY. I think the level of atrocity is much greater in this case in any event. Let me just ask you if you agree with my statement that the Soviet behavior and the atrocities in Afghanistan in fact constitute criminal behavior. They do indeed violate the Geneva Accords on Human Rights.

Secretary SHULTZ. Yes; I do not argue with that.

Senator HUMPHREY. Do you think it is wise to put the security of the United States and the west in the hands of—do you think it is wise to submit the security of the United States and the west to a treaty whose cosignatory is a nation conducting criminal activities against a largely defenseless people?

Secretary SHULTZ. Come off it, Senator.

Senator HUMPHREY. That is a sincere question.

Secretary SHULTZ. I do not know what you are leading to here. It is by way of saying, in your opinion—and I am not questioning your right to your opinion—but if what you are telling me is that we should not be willing to sit down with representatives of the Soviet Union to talk about anything at all, I just do not agree with you.

Senator HUMPHREY. I am all for talking, but I am also for honest to goodness linkage, Mr. Secretary. Let us see some real linkage.

Secretary SHULTZ. There is no point in talking with the Soviets unless you intend to at least try to reach an agreement if one you believe is in your interest turns out to be available.

Senator HUMPHREY. I am unfortunately out of time.

Chairman GOLDWATER. Senator Kennedy?

Senator KENNEDY. Thank you very much, Mr. Chairman. I want to welcome our two witnesses. I must say to the Secretary of State he needs no defenses to speak for himself. I have always found he has never been in a position of hedging. There have been times in which I have differed with him, but he has always, I have found, been forthcoming in expressing not only his view but the administration's view.

And I think quite frankly he has done that with our committee this morning, and I think this hearing has been extremely valuable to all of us on this committee that are attempting to meet our responsibilities in ensuring that we are going to have adequate security for our country.

If I could, Mr. Secretary, just continue one additional line of thought from a previous set of questions by the Senator from Michigan, Mr. Levin. In the ABM Treaty there are provisions for a

unilateral withdrawal by each of the particular countries for the usual circumstances. I do not have the treaty in front of me at this time, but there are those provisions there.

I am just wondering whether in completing the thought and discussion earlier on the ABM and the impact that SDI has on ABM, whether you are prepared to indicate that there would be at least—whether discussions and negotiations with the Soviet Union prior to that time, whether you would expect that they would withdraw, or that we would expect that we would make a breakout as a result of the requirements for testing SDI that might fall within the limitations provided for in the ABM Treaty.

Could we expect that kind of a——

Secretary SHULTZ. We cannot predict what the outcome of research would be, but in undertaking the research, we also undertake to remain serious about the ways in which possible outcomes of the research would affect the ABM Treaty. We intend to abide by its provisions.

Senator KENNEDY. Well, at some time, as I understand, in the course of the research there is going to have to be certain testing which would be inconsistent with the ABM Treaty. That is the testimony that we have had here in the course of the committee.

So we are in a situation at the present time that moving ahead with the research on the SDI and at least the indication of others, including the Secretary of Defense, that have indicated that they would move ahead toward deployment, at some time we are going to run out at cross purposes with the ABM Treaty.

I was wondering what your own view would be of that situation and what steps might be taken prior to the time that we would move toward a breakout as a result of their testing of the SDI or its deployment.

Secretary SHULTZ. Well, we do not contemplate a so-called breakout and I really cannot elaborate more on our attitude toward the ABM Treaty and all of its provisions. As you noted, I do think the subject of what is a test and what is a technical demonstration and so forth, these are very trickly line-drawing types of matters and they have to be addressed on their own terms and very carefully.

Senator KENNEDY. One of the objectives in going to Geneva, as I understand, is for the reduction of the heavy throwweight missiles of the Soviet Union, and I think all of us on this committee are extremely hopeful about the success of the administration in being able to make progress in the three areas which you have identified and which the negotiators have identified.

The concern that I would have is as the SDI research moves ahead it seems to me—and I would be wondering what your own kind of reaction would be—that we have the possibilities for a successful SDI in shooting down Soviet missiles in the boost phase. We also have the opportunity for the mid-course termination of those missiles, or the terminal defense.

And from the basic testimony that we have received here in this committee certainly one of the most complex is the boost phase aspect of the SDI. Does it not argue for the Soviet Union to maintain the heavier missiles, given that possibility or given that development, because the larger missiles are going to have the possibility for more decoys as well as more warheads and therefore, as we

begin to move into the negotiations in Geneva with the SDI, can we not expect that the Soviet response will be a hardening up in terms of their willingness to consider a significant, meaningful reduction in terms of heavy weapons systems?

Secretary SHULTZ. Well, in terms of the possible technical attributes of the SDI I prefer to have Secretary Weinberger comment on that since he is much more posted on it than I am. The Soviet negotiating campaign, that is, the public attributes of it, trying in a sense to offer something that I will say is tantalizing, at least potentially, in one of the offensive group negotiations and holding it hostage.

That is an obvious kind of tactic, and we will have to confront that and face it, with the kind of conceptual view we have of a better method of deterrence than the one we do have now.

Senator KENNEDY. Secretary Weinberger, did you want to make any comment about that?

Secretary WEINBERGER. Well, Senator, the strategic defense, if it works, would be a defense which would enable us through nonnuclear means to destroy Soviet intercontinental and intermediate-range ballistic missiles, as you indicated, first in the boost stage, and then, should any be missed, then in midseparation, midcourse, and then there would also be, to be completely certain about it, a terminal phase.

So these are the things that we have talked about. We have hopes that our technology will develop the necessary skills and techniques to be able to do this. I think the Soviets are working on the same thing, and I think they have indicated in a number of public and other statements their deep worries about our acquiring this kind of capability.

That is not by any means the only reason for doing it. I think we should pursue it because it does offer a much better way of maintaining deterrence if we are successful. Meanwhile, we have to maintain the offensive systems deterrent and we have to keep it modernized and strong enough to be effective.

Senator KENNEDY. Just on this point, in the response to my question you mentioned again the nonnuclear means, and you mentioned that again today. You referred to it earlier, to a foreign press group. Does this mean the administration has ruled out the use of the nuclear-pumped x-ray lasers?

Secretary WEINBERGER. No, we have not ruled out anything. What we are talking about is nonnuclear means of destruction, Senator, the way in which you would destroy the Soviet missiles. We believe it could be and should be, if it is possible to do it, by nonnuclear means.But we are not ruling out any methods of getting the necessary destructive power to the Soviet missiles. We hope to do it outside the atmosphere before they get near any targets.

Senator KENNEDY. So the nuclear pump x-ray lasers are still in research, still moving ahead, as well as the nuclear-tipped high atmospheric, exoatmospheric interceptors that are being tested, too, or research moving ahead on?

Secretary WEINBERGER. We are working at getting the means for energy required for the destruction of missiles outside the atmosphere. We are concentrating primarily on the actual destruction by

nonnuclear means so there would not be nuclear explosions required, and that is the hope and aim of our research.

But we do not have that, and so we pursue every path we can.

Senator KENNEDY. I would like to reserve for additional questions.

Chairman GOLDWATER. I might recess this particular hearing for a moment.

[A brief recess was taken.]

Chairman GOLDWATER. We will resume our hearing. I think Senator East is next in line.

Senator EAST. Thank you, Mr. Chairman.

I wish, as all the rest of my colleagues have done, to welcome these two distinguished gentlemen here this morning, and I would like to personally thank them for their kind letters of indulgence when I was recently hospitalized for surgery at Bethesda, which I can report the quality of medical service is very good. I appreciate your kind expressions of support.

I appreciate that time moves quickly. What I would really like to do today is make a few brief observations of my own, perhaps more to clarify my own thinking as to what this administration is doing, what is the broader context in which it currently sees the international scene.

Sometimes we get mixed signals. I can appreciate what the Secretary is saying, that the subtlety and the intricacy of international relations is such that you have to deal with specifics, but you have to deal with the broader context and there is a requirement of a great world power that you continue the process of discussion and negotiation in spite of the fact that you might isolate a particular item as being enormously offensive in terms of what Soviet conduct may be.

I can appreciate that the Secretary of State cannot say we refuse henceforward to engage in any kind of meaningful discussion with country A, B, or C based on conduct of X, Y, or Z. It occurs to me the problem we sometimes have in the Congress is that we are basically somewhat always using what I would call the inductive method, where we are very pragmatic.

We get obsessed with the SDI or the MX and this kind of thing, rather than I think what we need often is more of the deductive approach—that is, what broadly is occurring in our world—and then I think when one has an understanding of that the details fit a bit better into context.

Now I do not wish to be overly philosophical about that, but I do think that international relations ultimately must rest on a realistic understanding of the total, and I do not think either one of you gentlemen would quarrel with that. I just wanted to raise the subject in terms of sometimes maybe the few signals that we get from the administration, whether those are reconcilable or not.

I think that you have both made clear, for example, in recent news statements a very realistic understanding of Soviet power and intentions in the world. The Secretary of State has said they wish to expand the Brezhnev doctrine to Central America, and he has said that their philosophy seems to be what is ours is ours, and what is thine is potentially ours, too.

And in a protracted twilight conflict it occurs to me they invariably will win under those terms. They will win in Central America. They will win in southeast Asia. They will win in Africa. So I would agree with you there.

Secretary Weinberger has made clear the reality of the Soviet threat. General Vessey has made clear the potential for imbalances strategically and conventionally. My point is what—that I think that in the case of the Soviet mind you are not dealing with a conventional nation outlook. You are not dealing with Mexico or Canada, or a conventional power.

You are dealing with an armed ideology. You are dealing, whether we want to admit that or not, with an expansionist totalitarian mind. I think Margaret Thatcher put her finger on it the other day in the joint session to Congress: Their intentions are not benign. She mentioned 1939, where we were dealing with the armed ideology of the right in the Nazis, and now we are dealing with the armed ideology of the left.

As Solzhenitsyn has said, he wonders if the West has read the Communist manifesto as to what is the Marxist-Leninist view of the world. And I think the President understands it. I think you two gentlemen understand it. What I am concerned about is that in dealing with the Soviet Union in so-called negotiations we know that they have violated SALT I, II, Helsinki, biological warfare, et cetera.

Now I am not saying you cannot negotiate, you cannot discuss with them, but certainly there is not the least bit of naivete in the administration, I would hope, or in the State Department or in the Defense Department, that ultimately what we are up against is what a totalitarian armed ideology that eventually seeks—I do not wish to sound overly dramatic or melodramatic—but seeks world hegemony and domination.

Now having said that—and my time is probably up—I would appreciate the two of you commenting upon that. Would you agree with my general assessment of it? I am just trying to get a feel for the overview, the broad view, of this administration on what kind of a world it is we live and move and have our being today in terms of an international relationship, particularly vis-a-vis the Soviet Union and her proxies that are operating extensively throughout the world.

Secretary SHULTZ. Senator, I agree with the general philosophic thrust of your argument.

Secretary WEINBERGER. Yes, sir, I think that is the assumption we have to go on. That is, all the evidence supports that basic thesis and really supports only that thesis, that world domination is still their basic goal and that they are taking the military means and other means to try to achieve it.

Senator EAST. So there is an appreciation in the administration that that is the overriding fact, that everything else is simply an adjunct to it, is a corollary to it, is a facet of it, a dimension of it. It is not simplistic; I agree with the Secretary of State. And it is subtle. It is complex. It is intricate.

But as long as the overall view, I think, is a sound one and we are not deceived by getting obsessed with a particular tree, for example a tree of negotiation, as an end in and of itself, that that

enhances my confidence in the administration and its overall policy. But if I had for a moment a feeling that they did not share my concern about overall Soviet Marxist-Leninist intentions, if they did not understand the goal of the Communist manifesto, as Solzhenitsyn has put it, then I think we are in for a massive failure ultimately by the end of this century.

My time is up and I appreciate your indulgence.

Chairman GOLDWATER. Senator Glenn?

Senator GLENN. Thank you very much, Mr. Chairman.

I want to echo the sentiments of the chairman when he opened this hearing today, that combining armed services and foreign policy into one hearing is very useful; I particularly commend him for doing that. I think we do too little of this. It is impossible for us to have a rational armed services policy if we have not taken care of the foreign policy aspects that should drive that.

And, conversely, you cannot make foreign policy without considering what our armed services are going to do. And just to back that up I made every effort in committee assignments this time to be assigned on both the Foreign Relations and Armed Services Committees. It did not work out that way, and here I am, and glad to be here. But I think we need to do more of that and I, for one, would back the chairman if he wanted to start a movement here to combine the Armed Services and Foreign Relations Committees into one.

I think we would do our Nation a better job, even though it would certainly cut out all the little subcommittees we use for press releases back home. But maybe we could forego that in the interest of what is best for the country.

You both have stressed the MX and I gather we are going to hear more about this at the White House this afternoon when we go over. I understand the committee is going to the White House. The real peacekeeper, gentlemen, to me are the sub forces that we have at sea, carrying the SLBM's.

About 53 percent of our strategic nuclear forces, I believe, are at sea. Why are those so good? Well, because the Soviets do not know where they are and they cannot attack them directly, and, therefore, they provide, as I see it, the very finest of what the Secretary of Defense said this morning.

I believe I wrote down his statement correctly here in answer to a question. He said, "Even after the first strike they would know we would have a retaliatory capability." And that is the purpose of this whole thing. We are not going to make any first strike on the Soviet Union. I cannot see us ever doing that, really. But we want a guaranteed response, and that is what the whole thing is all about.

Now what are the Soviets doing in this regard? If we look at their development program over there, the SS–17, SS–18, and SS–19 are silos. The SS–20 is mobile. It has the capability of being an ICBM and becoming an SS–16 with the addition of one additional stage. The SS–24, then, was developed as a silo, but it has a mobile capability being developed, and it is more accurate than the SS–18 and the SS–19. And the SS–25 is a pure mobile.

Now we have to ask why are the Soviets going mobile. Well, I think it is because of the same thing, that they see it as the best

deterrent from their standpoint. Looking at it from the Kremlin, it gives a better guaranteed response for them.

I would say why do we worry about the SS–20's in Europe? Because they are mobile. We do not know where on Earth we are going to shoot if a war starts. Why do they give us fits about the Pershings? It is because they do not know where they are going to be.

And both of you gentlemen have sat in on war games, I am sure, and you know what happens when the mobility factor comes up. Everything goes up in smoke pretty much—and that is a figure of speech there that is not good in this context, I guess—but we do not know what to do most of the time. So we make some halfway guess about yes, maybe they will be over here; maybe someplace else. We need better intelligence. What can the satellites give us?

We wargame this thing, but the mobility is what gives us fits and I am sure it gives the Soviets the same kind of difficulty. I did not disagree when I first came to the Senate with the need for a new missile and I do not now, but I led the fight on the Senate floor 5 years ago this August that we go mobile and not get ourselves tied to this 192,000-pound MX that can only sit in one spot and be an even more attractive target than anything it is replacing.

And so that has given me pause. I appeared before the Townes Commission and all the other groups that have considered this through the years, and the only reason they ever said we could not go the mobile route was that they felt it was because of public interface. Those were the magic words back 4 or 5 years ago—public interface. The American people would never accept a mobile.

We asked the Europeans to do it. They wanted it at one time. We developed it. Then they backed off a little. Now we have it over there. It is mobile. The Soviets have a mobile, but somehow the American people are so sensitive that even in our own defense we cannot possibly have a mobile in this country. To me I just think that that is the way we should be going.

So I would ask as a first question this morning what does the MX contribute to a guaranteed response that a mobile cannot do better—either one or both of you.

Secretary WEINBERGER. Senator, the first thing it contributes is far greater accuracy, which the Soviets would know about. A second one is because of its ability to deliver 10 warheads it can reach more of the Soviet targets.

There is a very strong argument for mobility and we are developing a mobile capability with the small single warhead missile. We do not have it now and we will not have it for a number of years, because that is just the nature of the thing, that it takes that long to develop a new missile system.

But I do not argue for a moment with you that we should not have a mobile capability. But the important thing is to get a mobile capability that gives you the advantages of mobility, and that is not to have a number of fixed silos and move it back and forth to and from those various fixed silos. True mobility is, I think, a means of helping to ensure survivability.

But the MX contributes a great deal to deterrent capability because it has a far greater accuracy and thereby the Soviets would know that it had a far greater ability to deal with their hardened targets, which at the moment we unfortunately do not have the capability of doing to the extent that we need it.

So I would think that it does add greatly to our current deterrent capability and that it is important to do that rather than always postponing doing that in the hope that something better or something else will come along. The worry is that you have to keep this deterrent capability there at all times, and this is the system on which we have spent 12 years and about $12 billion, and it is the one that is the closest to deployment and, therefore, it is the one, because of its increased accuracy and the additional things it gives you that would add most to the deterrent as of right now.

Senator GLENN. Accuracy is one that I went into in some depth here 8 or 10 months ago with some people, and most of the people feel that we are getting to accuracies now, whether it is a mobile—and I do not quarrel with the fact that the MX would be slightly more accurate—but we are getting to accuracy differences here that are very, very small compared to the area of blast damage around the target.

I think we are getting down to where—and I do not want to go into it in open session, but I think we are getting down to where the accuracy differences are sufficiently small that the difference between an MX and a mobile is not that great.

Secretary WEINBERGER. I am not talking about the difference between an MX and a mobile, Senator. I am talking about the difference between the MX and what we have now, and we have at least twice as much accuracy. We can go into much greater detail in closed session, and we are getting very fine results from the MX tests that we are doing now. We have had six tests, and they have exceeded design specifications very substantially.

Senator GLENN. We have always talked about the mobile as being a single warhead, but I think it quite within our technical capability that it could be a triple perhaps, or a double at least, not just a single, and still be in the mobile category that would be quite portable and quite movable anywhere we wanted to go.

And the time frame that I have been given by some of the people was that we could have this within the 1980's. I know we have always talked about it up into the 1992-94 time period, but the experts that are working on some of these have indicated to me they felt we could be well within the 1980's if we went ahead with a real program.

Secretary WEINBERGER. Well, I think, Senator, the answer is nobody knows. The best estimates we have are in the 1990's and again it is not an area in which you can afford to be very wrong or to delay very long, and we have already delayed a very long time. We are gaining what we believe is a credible deterrent in these offensive systems.

Senator GLENN. Let me say this, too. I am very complimentary that we are finally moving in this direction. I had an amendment that was put in a couple of years ago that I think helped get things going on the small mobile. The Armed Services Committee report

in the 1985 authorization bill was also complimentary that you are moving ahead in that direction.

General Eglund is now at Norton and is heading up this effort. I visited with him and I think they are moving on this. I hope you keep going with that because I see this as being the best land-based system we will have that is complementary to the sub system. The submarine has three degrees of freedom out there. The land-based system has only two in a mobile status, as opposed to just one if we go to a fixed silo system.

Secretary WEINBERGER. Without any question we are moving ahead on it. We have provisions in the budget before you for the small missile, and we have a very aggressive program of trying to develop it. We do feel that the triad is essential. Certainly the submarine is a very survivable portion of the triad, but there are other aspects to it that make it essential that we have the other two parts of the triad modern and available.

The other thing, of course, with the small mobile missile is that you do have a very large number of Soviet targets, and that, of course, is something we could go into in closed session, but the small mobile missile is high on our priority list and we are moving ahead with it vigorously and aggressively and hope that the provisions for it in this year's budget are approved.

Senator GLENN. Senator Kennedy asked a question and what I thought he was getting at was what the power source of any of the SDI weapons systems might be, and I am not sure I understood your reply. I think what he was referring to was are we considering using nuclear explosive power in space to power the directed energy weapon.

Secretary WEINBERGER. There are a number of different kinds of ways of getting the destructive power out, and I think they are looking at some of the ways that might involve initial use of nuclear power, not nuclear destructive power but the power to propel the destructive power out. And they are looking at a number of different kinds of systems, Senator, as indeed they have to. But our goal, our aim is to have the destruction of the Soviet missiles be by nonnuclear means far enough out in the atmosphere so that the missiles would not be getting near any target.

Senator GLENN. I thought that was what you meant by your reply, but I was not all that certain.

I know my time is up, Mr. Chairman, but last summer I took about a 10-day trip visiting the leading scientists in the country working on lasers and neutral particle beams and microwave projection and so on. And there was not a single one of them that felt that we would have the option to go ahead with a star wars system in under 10 years, that it is going to take at least that long to invent the system, invent the basic physics, which we do not have yet.

And if there has been one criticism I have had for this from the word go, it was that the program had been sold to the American people on the basis that we almost have it here and now, and I have had questions from my own constituents in Ohio about why we are holding up on going ahead and deloying this thing the President talks about.

And I keep telling them it is like Julius Cesaer stockpiling shotguns. He has to invent gunpowder before he can use them.

Secretary WEINBERGER. I do not know who else may have been guilty of what you are saying, if anybody has, but certainly every time I have made a talk about it—which is much too frequent –I have never said anything other than we do not have it now. We have no date when we know we can get it, just as I responded to a question earlier. We believe it is vital to keep working on it.

I think it is within our scientific capabilities, but I have no idea when we could get it, nor the dimensions of the final system or anything of the sort. But it is an enormously hopeful concept and it is vital that we have the public support, I think, necessary to pursue the research that I trust would lead us to it.

Senator GLENN. I am in favor of the research. I think the misleading statements come from well above your level, Mr. Secretary, and that cannot be too many different people.

Thank you, Mr. Chairman.

Chairman GOLDWATER. Thank you. Senator Wilson?

Senator WILSON. Thank you, Mr. Chairman.

First I welcome Secretary Shultz and Secretary Weinberger. Before addressing my questions to them, however, I welcome the statement from my colleague from Ohio, Senator Glenn, with respect to the possibility of having more than a single warhead on the small missile. As attractive as is the concept of mobility, I think that in a letter that I have addressed to the Chairman of the Strategic Subcommittee, Senator Warner, I have made clear that congressionally-imposed design constraints which perhaps necessitate calling the small missile a Congressman rather than Midgetman, are severe.

But one of those recommendations contained in that letter is that the Air Force be advised or directed to explore the possibility of more than one warhead on the small missile.

Let me shift to the subject of compliance or, more accurately, Soviet noncompliance. I would address my question first to Secretary Shultz. Mr. Secretary, I know that the subject of Soviet noncompliance was part of your initial discussion in Geneva. My question now is who will have overall responsibility for dealing with the subject of noncompliance during the negotiations there?

Secretary SHULTZ. Well, the negotiations in Geneva are not about compliance. They are about trying to get reductions in nuclear armaments. They will, however, offer us opportunities to discuss the subject of what can be done about problems that we see arising from noncompliance or, as Senator Denton put it, pushing activities to the absolute limits of any reasonable interpretation of a treaty.

I think in particular I have already talked about that in connection with the ABM area, and presumably that would fall in the group that is being headed by Ambassador Kampelman.

Senator WILSON. Well, I take it that you think that of the reported violations, the incidents of noncompliance, some at least of these are quite serious and do deserve our attention?

Secretary SHULTZ. Well, any time there is noncompliance with a treaty obligation, I think it is quite serious, even if the particular constraint being violated is not particularly militarily significant.

But it shows a willingness to violate a treaty obligation. It is in fact the principle, that we have to take seriously.

Some areas of noncompliance do have more serious military implications than others, so we have to focus on those areas.

Senator WILSON. I would suggest respectfully that one of those would be encryption of telemetry.

Secretary SHULTZ. Yes, I think you are right.

Senator WILSON. It seems to me that has very severe military implications and the kind of implications that you have just discussed with respect to the seriousness of purpose of those entering into a treaty. For that reason, while our purpose is to discuss reductions, it seems to me that Geneva presents an opportunity for us to make a linkage—to not overwork a phrase this morning—of a very important kind.

And the suggestion has been made by some. Senator Glenn has indicated that some of his constituents ask him hopeful questions. I think we have probably all had the experience of being asked why we should enter into new negotiations when the Soviets are breaking the old ones, and I am not asking you to answer that one this morning, but I think there is a certain logic in it.

What people are really saying is can they be trusted on new negotiations. So let me just suggest to you not that we do anything less than engage vigorously in the kind of negotiations which Ambassador Kampelman will be heading, but it does seem to me that there should be a penalty for the Soviets and that they should know that that penalty exists.

I will simply suggest that one thing that we might do, I think at a minimum, is to make clear that as seriously as we desire these negotiations to be successful that we will retain the right, the Senate in particular having this responsibility, to refuse to ratify any new agreement until such things as the encryption of telemetry are cured.

Secretary SHULTZ. Well, I would think that it would be unwise for the Senate to pick out some particular thing and then say either you do this our way or else everything else falls. I think the encryption problem is a major problem and undoubtedly it will be addressed, but if you start down that road I have the impression that each Senator would probably have a different thing.

Mr. Humphrey would make it all fall on whether or not the Soviets get out of Afghanistan. You would make it all fall on encryption. And so on around, and we would not have much of a negotiation under those circumstances.

Senator WILSON. Mr. Secretary, I am not suggesting that you not have a productive negotiation. I am suggesting that there does need to be a means of getting the other side to adhere to the bargain.

Let me ask Secretary Weinberger notwithstanding the comments that you have made about the uncertainty of when various stages of the defensive technology would be available to us, I think there is some cause for optimism, at least so a number of people believe from both sides of the aisle.

Recently the New York Times magazine carried a very interesting story in which three people coauthored a piece—Ambassador Kampelman, being one, Mr. Brzezinski being another, and the

third was Professor Jastrow, who of course I think is well known to have some professional competence as a physicist.

There was a suggestion, in fact an explicit statement made that by the early 1990's at least some form of this technology would be available and could be deployed, if that decision were taken. Let me simply ask you, Mr. Secretary, would not the deterrent effect of a U.S. MX counterforce be made far more credible and persuasive if that MX counterforce were made more survivable by deployment of defense weapons to protect them?

Secretary WEINBERGER. Well, Senator, the defensive system we are talking about does not guard any particular target. It guards the United States, and it guards Europe from intermediate-range missiles. So you would not be talking about making the ground-based missiles systems that we have or hope to have in place more survivable by deploying the SDI. We would make the world more survivable by deploying the SDI.

Senator WILSON. All right, then, let us focus more narrowly on the counterforce and its survivability, because you have a number of my colleagues who intend to vote against MX based on their contention that it is a fixed silo housed mechanism that is extraordinarily vulnerable and that it is simply not survivable.

Now in his statement Secretary Shultz mentioned the possibility of hardening or superhardening. It seems to me that another option over time as this defensive technology develops is in fact terminal defense of the retaliatory counterforce.

Secretary WEINBERGER. Well, your superhardening is certainly a possibility. We have had very great and encouraging engineering developments that indicate superhardening is possible beyond what had been felt or imagined a very short time ago. That is an option that would be clearly open to the Congress. It again is not available immediately, and we cannot always postpone doing what we have to do in the hope that something better may come along.

But superhardening is a real possibility. Terminal defense is perhaps the last phase of the Strategic Defense Initiative that we should be thinking about. We have a form of terminal defense now, although it is not completely effective by any means, and it is capable of being overwhelmed.

What is important from our point of view, Senator, is to have much greater accuracy and greater yield and the number of warheads in the ground as a credible usable deterrent, and that is what we think is essential and that is what various administrations have felt was essential over the years.

We certainly understand that anything that is in the ground is vulnerable to some extent, but the Soviets were not delayed or deterred from upgrading enormously their system by putting in the SS-18's and the SS-19's and they have that. And they have had them ready for many years. So we do need to have a modernization of our existing deterrent.

We need at the same time to continue working and doing the research that we hope will lead us to a strategic defense that would defend all of us and not just a specific target.

Senator WILSON. Mr. Chairman, my time is up, but let me just ask for the record, and Secretary Weinberger can supply it at his leisure, whether or not there has been any cost comparison of su-

perhardening as a means of enhancing survivability of the MX with what is admittedly a rudimentary stage of defensive technology, that of terminal defense.

It would be interesting to me to have not only that comparison but also a projection of what a small force but an adequate force would be, because in a number of briefings I have been led to believe that the Soviet attack would have to be a very sophisticated one in terms of the timing of even a first strike, that as a result of that the introduction of even a rudimentary defensive technology greatly enhances the uncertainty of success of that first strike.

So I would be grateful if some comparison could be made. That may require a closed hearing, but I think it is very much to the point before it comes time to vote on MX.

Secretary WEINBERGER. We would be glad to submit that to you. As you say, it will probably have to be submitted in classified form.

Chairman GOLDWATER. Senator Bingaman?

Senator BINGAMAN. Thank you very much, Mr. Chairman.

Let me thank both Secretary Shultz and Secretary Weinberger for appearing and waiting for these last few questions from the committee. Your endurance is impressive.

Let me tell you the thrust of my questions first. It is that I seem to get mixed signals about our expectations out of these talks that are going forward in Geneva. The testimony we hear in the committee here, at least as I hear the testimony, would lead me to conclude that the prospects of arms control are very, very poor. And yet the public perception that is abroad is that we are hopeful and perhaps even optimistic that something could be done.

Let me be a little more specific. We had testimony from Mr. Perle here in the committee the other day on February 20, where he said, speaking about Soviet actions on compliance:

> . . . Soviets have not hesitated to mislead us deliberately and all too successfully in order to achieve their purpose in negotiating prior agreements. They care nothing for the spirit of agreements and, when it suits their purpose, little more for their letter.

He also seemed, in my view at any rate, to make it clear in previous testimony and several other people in the administration have made it very clear, that the modernizing of weapons, the new technology, makes verification much more difficult than it ever was.

So you have this record of noncompliance. You have the problem, as he put it, of intentional efforts by the Soviets to mislead us in negotiations. You have increasing problems of verification and all that leads me to conclude that the prospects for arms control at this time are somewhere between minimal and abysmal.

And yet, as I say, the public statements that are made and that I have to try to interpret for my constituents in New Mexico are much more hopeful. I would be anxious to have either or both of you clarify this, if it is possible.

Secretary SHULTZ. Well, I think you very well put the interaction between the problems that are certainly apparent in these negotiations as well as the outlook that one can have about them.

I believe that we should stay away from words like "optimism" and "pessimism" and that what we should do from the standpoint of the United States is to negotiate recognizing that if there is a

successful outcome at least we can envisage outcomes that would be in our interest as well as theirs, or there would not be an outcome. We should go there prepared to try to find acceptable agreements. In other words, we should go there in a constructive frame of mind.

Beyond that, however, we know, and your comments I think are very valid, that there are difficulties involved conceptually, even leaving aside some of the more detailed operational characteristics of the negotiations. So that suggests that you should not go there expecting to see things happen in a hurry, because it is complicated and will be difficult.

We need to be prepared to be patient in these negotiations and have staying power. Of course, what that means to me is that we have to give more attention to what we do back home that provides for the basics of staying power than we do in terms of what the negotiators actually say in some session in Geneva. There is always a fascination in any bargaining setup with the actual negotiations at the table.

But I know that all of us who have been involved in negotiations over the years realize that the more important and difficult negotiations are within the constituencies involved and the desire to hold them in a unified and strong position. So we need to concentrate very much on that.

I will just say on my own behalf here that I think the stakes in the negotiation are enormous. There is a great deal to be gained. There are also things to be lost by a bad agreement. I do not expect we will make any bad agreements, but there is a lot to be gained by a good agreement. And given the technological developments that are involved here it may be the last time to really address some of these issues with any prospect of success, because the technology has a great movement to it.

I do think on the question of the particulars that we can take some reassurance from the fact that we have three people conducting these negotiations on our behalf who are really terrific, extremely capable people, great patriots, knowledgeable about what they are doing, and I think they will give us a very, very high quality of representation. We intend from the standpoint of the administration to give them every bit of support we possibly can.

Senator BINGAMAN. Thank you.

Secretary Weinberger, did you want to add anything to that?

Secretary WEINBERGER. No, sir; I agree with that completely. I think the quotes that you read at the beginning of your question measure the difficulty of the task. I would not disagree with any of the things that you read about the prior problems or behavior of the Soviets or anything of the kind. That measures the difficulty.

But, as the Secretary of State says, the opportunities are there and we have to take advantage of them and do everything we can. And as far as optimism or pessimism is concerned, I simply have hope that we will get the kind of agreements that it would be in our interest to sign.

I know there will be tremendous pressures for us to try to reach some kind of an agreement just so we can say we have had an agreement. And I know there is a clear desire on the part of everyone to resist that kind of pressure. It is usually said that the Sovi-

ets can almost always prevail over impatient democracies, and I think we have to be very clear that we are not going to be impatient but that we are going to be patient.

Senator BINGAMAN. Let me ask about a report we received 11 months ago, a report to the Congress on U.S. policy on ASAT arms control, March 31, 1984. In that report on the first page there is the statement:

> However, no arrangements or agreements beyond those already governing military activities in outer space have been found to date that are judged to be in the overall interest of the United States and its allies.

Now is that the position we are going to these talks in Geneva with in regard to agreements in outer space, that we know of no agreements? That is the way I interpret that. Perhaps either or both of you would want to interpret that for me and tell me if that is still our position.

Secretary SHULTZ. Well, we are ready to listen to whatever the Soviets may want to suggest, obviously, and I think in the field of limits on antisatellite weapons you come right up against the question of verification.

We recognize that the only deployed antisatellite weapon that we know of is one that has been deployed by the Soviet Union. It is of such a nature that if they said that they were ready to undeploy it you really would not have any way of knowing whether that is so or not because the ingredients that would send it aloft are similar to many others.

Maybe the Soviets will have something to point out to us that we do not see. There is a tendency to focus on testing because that you can verify, and, of course, here we confront the fact that they have tested their system, obviously, before they deployed it, and we have yet to conduct a genuine test of the system that we have under development.

So that is an unequal stage at which to try to control things. But obviously we will be prepared to discuss this and try to find reasonable outcomes, if they are to be found.

Senator BINGAMAN. Thank you very much.

Chairman GOLDWATER. Senator Gramm?

Senator GRAMM. Thank you, Mr. Chairman.

It is clear from your statements and the fact that we are going to the White House this afternoon that we are really here to talk about MX and that we have spent a lot of time talking about other things. I would like to pose a couple of questions about MX, but let me review sort of my perspective on the problem as we move to new debate on MX.

I have been involved in six debates on MX in the House. This will be my first in the Senate. I remember vividly when I came to the House in 1979 we were in the midst of a debate over the basing mode. We were still hotly considering the underground railroad, and that was quickly determined to have clay feet as an ironclad protection against a first strike capacity of wiping out the missile and destroying its deterrent capacity.

We then had a detailed study about possible basing aboard in-flight aircraft and gradually, one by one, this perfect system fell away and with it support for the MX fell away. It seems to me that

during the period we had a distinct failure to look at the issues involved.

One was a superior basing mode and the other was the modernization argument, that there was no weapon that was currently in research that could come on and replace weapons that were becoming obsolete other than the MX and that the basing mode question was a separate question.

Having sat through the debate for 6 years in the House I would guess the Senate debate will be similar. There will be people who will rise and point out how we have not set out a basing mode and that that represents the fundamental weakness of the system. Obviously I do not buy that argument. I believe the system is needed for modernization.

But I would like to give you an opportunity here on the record to respond to the basing mode argument. What will the basing mode for the MX be and why, given the limitations on that basing mode, is the MX still a good investment for the American taxpayer?

Secretary WEINBERGER. Senator, that is a very good question, and I am glad to have the opportunity to respond to it.

The basing mode is the use of existing silos modified to take the MX. It is possible, as we have discussed and will be in the coming years, to secure vastly greater hardness on those existing silos or on new silos that would be constructed by then.

We have looked at a number of different modes. The President, when he first came into office, concluded that there was no sufficient addition to the Nation's security by the so-called racetrack mode of moving 200 missiles into 4,200 different holes or garages or silos by transporters, because those were also fixed in known locations. So that mode he did feel should be canceled and he did cancel it.

I have frequently heard it said we never canceled a weapon system. We canceled the biggest weapon system of all when he canceled that, and he recommended that we go to this mode because this was the most rapid way of getting an effective deterrent modernized and in the ground and thereby adding to the deterrence rather than adding only to the discussion.

There have been examinations made of a number of other modes, and one way or another they have had various faults found with them, as indeed the existing mode system has faults with it. There is no perfect method of basing the ground-based missiles because it is possible to have a great deal of counter activity developed as soon as one basing mode is chosen.

But the basing mode we have is the one the President recommended in 1981. It was rejected then. We have looked at others and we have come back to this one after the Scowcroft Commission unanimously recommended it, and we secured approval of 21 of the missiles in fiscal year 1984, and we are very hopeful that the 21 appropriated in 1985 will be permitted by vote of the Congress for us to develop and deploy.

I think that what we have is a system which will add enormously to the deterrent capabilities of the United States and thereby add to our safety. We hope very much that we will have, as we have said, a better system in the sense of strategic defense come to fruition. We do not know when that will be.

And, as you pointed out, you have been through six debates. We have discussed the matter 12 years now, and the important thing is to get in the ground, ready to use, a system which will add to the deterrent capability that we have neglected for far too long. So that is why we urge so strongly that we proceed with the present program on the MX.

Senator GRAMM. Do you see the Midgetman missile as in any way being a substitute for MX?

Secretary WEINBERGER. I think it can be a useful addition to our deterrent capability if we are able to develop the mobile characteristics on which we are working. But it has one warhead. The MX has 10. And the construction of 1,000 small missiles which would be necessary to have equal substitution is a very expensive proposition.

I envision them as existing side by side in the deterrent capabilities that we will have until, and I hope it is only until, we are able to have the strategic defense initiative.

Senator GRAMM. Mr. Secretary, I would like to have some data giving a comparison of the cost of 1,000 Midgetmen as opposed to 100 MX missiles.

[The information follows:]

COST COMPARISON BETWEEN THE MX AND MIDGETMAN MISSILES

The Small ICBM program is just completing the concept development phase of acquisition and is about to begin a two year pre-Full Scale Development (FSD) program, the Air Force will select the optimum design for the three stage booster; the most cost effective, accurate, and responsive guidance system; and the most survivable, yet fiscally feasible basing mode. During this selection process, we will also identify the force structure and determine the most efficient production schedule. To provide a cost comparison before these assessments are complete would be premature.

Senator GRAMM. I would like to ask, finally, we have had some discussion here on the basing mode idea of mobility. I guess I am one of these people that believes it is going to be difficult in a society like ours to go as far as the Soviets clearly have gone and are intending to go with mobile basing. I see innumerable problems from public protest to a security problem against terrorists if you actually have mobile missiles moving around the country on railroad tracks or highways.

Do you see that as being the kind of potential impediment to deployment that I do, or do you think those concerns can be dealt with?

Secretary WEINBERGER. Senator, there is no question that they are very large concerns in the United States. The Soviet Union has been very successful with their environmental impact statements and they have got them approved immediately. But we would have a very long time, and if we debate whether or not we should even go ahead with a system for 12 years, that would give you a rough idea, I think, of how long the debate would be about the various protests and environmental concerns and others that would be filed about a mobile system.

But we will certainly try to furnish the cost comparison of the two that you mentioned earlier, and again bear in mind that there is close to $13 billion, a little over $12 billion, already sunk into the MX, so you are talking about that and our being able now to

deploy the missiles as we manufacture them, as compared with a system which we do not yet have any of the necessary preliminary work done.

We are, however, moving ahead as rapidly as we can to develop the single small missile, and there are before you the necessary requirements to continue that work in this year's budget.

Senator GRAMM. Thank you, Mr. Chairman.

Secretary SHULTZ. Mr. Chairman, could I make a comment?

Chairman GOLDWATER. Sure.

Secretary SHULTZ. In response to your first question, I would like to make two points supporting Secretary Weinberger's statement, two things that have impressed me particularly on the survivability question about the MX.

The first has to do with the points that he made about the knowledge of how to literally make the silos more hard and therefore more difficult to knock out, and the orders of magnitude involved are quite impressive, I think, quite impressive.

And second is the contribution that each leg of the triad makes to the survivability of the others. I found the discussion in the Scowcroft Commission report that appears under IV(A), called Strategic Forces as a Whole, that begins on page 7 and is just a couple of pages, to be very interesting reading about the interplay of the various legs of this stool.

I would like to ask that it be put in the record, just this section—it is only a page or so—and I would call your attention to it because I thought it was an interesting line of argument.

[The information follows:]

REPORT OF THE PRESIDENT'S COMMISSION ON STRATEGIC FORCES—APRIL 1983

PRESIDENT'S COMMISSION ON STRATEGIC FORCES
April 6, 1983.

The PRESIDENT,
The White House,
Washington, DC.

DEAR MR. PRESIDENT: On January 3 of this year you asked us to review the strategic modernization program of the United States. In particular, you asked us to examine the future of our ICBM forces and to recommend basing alternatives.

In the ensuing three months we have held 28 full meetings and numerous smaller conferences, and have talked to over 200 technical experts as we have reviewed U.S. strategic policy and forces. We have also consulted closely with Members of Congress, as you requested.

There are no simple solutions to the questions that must be answered in basing our forces, achieving equitable arms control agreements, and improving strategic stability. Our lengthy review and extended deliberations, however, have led us unanimously to conclusions and recommendations which we hope will provide the basis for a broad national consensus on these difficult issues. The Commission's Senior Counselors set forth below also support the recommendations of this report. Our recommendations and the reasoning behind them are set forth in the attached report.

We appreciate the opportunity to be of service. We hope our efforts will prove helpful in the Nation's pursuit of peace and security.

Respectfully yours,

BRENT SCOWCROFT, *Chairman.*

The Commission:

Nicholas F. Brady, William Clements, John M. Deutch, Alexander M. Haig, Jr., Richard Helms, John H. Lyons, William J. Perry, Thomas C. Reed, Levering Smith, R. James Woolsey.

Senior Counselors to the Commission:

Harold Brown, Lloyd N. Cutler, Henry A. Kissinger, Melvin R. Laird, John McCone, Donald H. Rumsfeld, James R. Schlesinger, Marvin C. Atkins, Executive Secretary.

IV. U.S. Strategic Forces and Trends

A. STRATEGIC FORCES AS A WHOLE

The development of the components of our strategic forces—the multiplicity of intercontinental ballistic missiles (ICBMs), submarine-launched ballistic missiles (SLBMs), and bombers—was in part the result of an historical evolution. This triad of forces, however, serves several important purposes.

First, the existence of several strategic forces requires the Soviets to solve a number of different problems in their efforts to plan how they might try to overcome them. Our objective, after all, is to make their planning of any such attack as difficult as we can. If it were possible for the Soviets to concentrate their research and development efforts on putting only one or two components of U.S. strategic forces at risk—e.g., by an intensive effort at anti-submarine warfare to attempt to threaten our ballistic missile submarines—both their incentive to do so and their potential gains would be sharply increased. Thus the existence of several components of our strategic forces permits each to function as a hedge against possible Soviet successes in endangering any of the others. For example, at earlier times uncertainties about the vulnerability of our bomber force were alleviated by our confidence in the survivability of our ICBMs. And although the survivability of our ICBMs is today a matter of concern (especially when that problem is viewed in isolation) it would be far more serious if we did not have a force of ballistic missile submarines at sea and a bomber force. By the same token, over the long run it would be unwise to rely so heavily on submarines as our only ballistic missile force that a Soviet breakthrough in anti-submarine warfare could not be offset by other strategic systems.

Second, the different components of our strategic forces would force the Soviets, if they were to contemplate an all-out attack, to make choices which would lead them to reduce significantly their effectiveness against one component in order to attack another. For example, if Soviet war planners should decide to attack our bomber and submarine bases and our ICBM silos with simultaneous detonations—by delaying missile launches from close-in submarines so that such missiles would arrive at our bombers bases at the same time the Soviet ICBM warheads (with their longer time of flight) would arrive at our ICBM silos—then a very high proportion of our alert bombers would have escaped before their bases were struck. This is because we would have been able to, and would have, ordered our bombers to take off from their bases within moments after the launch of the first Soviet ICBMs. If the Soviets, on the other hand, chose rather to launch their ICBM and SLBM attacks at the same moment (hoping to destroy a higher proportion of our bombers with SLBMs having a short time of flight), there would be a period of over a quarter of an hour after nuclear detonations had occurred on U.S. bomber bases but before our ICBMs had been struck. In such a case the Soviets should have no confidence that we would refrain from launching our ICBMs during that interval after we had been hit. It is important to appreciate that this would not be a "launch-on-warning," or even a "launch under attack," but rather a launch after attack—after massive nuclear detonations had already occurred on U.S. soil.

Thus our bombers and ICBMs are more survivable together against Soviet attack than either would be alone. This illustrates that the different components of our strategic forces should be assessed collectively and not in isolation. It also suggests that whereas it is highly desirable that a component of the strategic forces be survivable when it is viewed separately, it makes a major contribution to deterrence even if its survivability depends in substantial measure on the existence of one or the other components of the force.

The third purpose served by having multiple components in our strategic forces is that each component has unique properties not present in the others. Nuclear submarines have the advantage of being able to stay submerged and hidden for months at a time, and thus the missiles they carry may reasonably be held in reserve rather than being used early in the event of attack. Bombers may be launched from their bases on warning without irretrievably committing them to an attack; also, their weapons, though they arrive in hours, not minutes, have excellent accuracy against a range of possible targets. ICBMs have advantages in command and control, in the ability to be retargeted readily, and in accuracy. This means that ICBMs are espe-

cially effective in deterring Soviet threats of massive conventional or limited nuclear attacks, because they could most credibly respond promptly and controllably against specific military targets and thereby promptly disrupt an attack on us or our allies.

Senator GRAMM. Thank you, Mr. Secretary.

Chairman GOLDWATER. I want to thank both of you gentlemen and to expedite things I have three questions that I will submit and you can answer them for the record.

You have been very diligent and very patient. I know we take a lot of your time when you should be over there in other parts of our city doing your job, but we have to know these things and I speak for the whole committee when I say thank you. Unless you have further comments, the meeting is adjourned.

Secretary WEINBERGER. Thank you very much, sir.

Secretary SHULTZ. Thank you.

[Questions submitted for the hearing record with answers supplied:]

QUESTIONS SUBMITTED BY SENATOR BARRY GOLDWATER

MX PRODUCTION LINE IN A STANDBY STATUS

Senator GOLDWATER. Last year, a proposal to put the MX production line in a "standby status" was very narrowly defeated in the Senate. Can you comment on the effect of such a proposal on our ability to maintain a viable production capability? What effect would such a proposal have on total program costs and production efficiencies if it were necessary to "restart" production? Would you recommend canceling the program if Congress only approved the maintenance of a "warm" production line?"

Secretary WEINBERGER. Maintaining a "warm production line" for Peacekeeper essentially consists of providing funds to the many Peacekeeper subcontractors and vendors to retain required personnel in a standby status, perform maintenance on production tooling, and preserve the capability to restart production at a later time. The purpose is to avoid a major deterioration of the production capability resulting from a production break and to reduce substantial restart penalties when production is resumed.

It is not clear that we can maintain a viable production capability without building anything, even if funds are provided for this purpose. Without actual hardware production, there is uncertainty whether all of the production techniques and processes can remain certified over time. There is also the concern over possible loss of key vendors and subcontractors due to uncertainty of continued production. So such funding does not guarantee that production can be quickly resumed.

If the Air Force does not receive the $1.5 billion for continued Peacekeeper production, to maintain a Peacekeeper production capability until fiscal year 1986 would have a number of impacts. First, this would require a supplemental appropriation in fiscal year 1985 to keep an option for production continuation and allow the basing support to continue until fiscal year 1986 funding is provided. The production break of over 6 months would result in a minimum 6-month delay in system Full Operational Capability (FOC), a two year delay in the operational flight test program, a 2-year delay in the aging reliability program, and a stretchout of the deployment schedule. This would have the net effect of delaying needed deterrent capability, reducing our initial confidence in the deployed force, and adding to overall program costs. The net program cost growth would be more than $650 million ($ TY). These impacts assume the production restart occurs promptly in fiscal year 1986 and without any major difficulties. As discussed, timely production continuation would not be guaranteed.

The current situation of another full authorization and appropriation vote in both houses of Congress is the result of a careful compromise arrived at by the leadership of the House and Senate. The Air Force has abided exactly by this arrangement. The guidelines of the conference language is explicit. Following a report by the President stating the continued need for the MX program, the Congress will consider a vote to release the funds for the second increment of production missiles. Alternatives that try to continue production capability only without producing missiles, are not the subject of this vote.

Our recommendations on how to proceed were the Congress to release the $1.5 billion of authorized and appropriated fiscal year 1985 funds would depend on the circumstances at the time following such a vote.

Senator GOLDWATER. In your judgement, what importance do the Soviets attach to the MX missile in the upcoming negotiations?

Secretary SHULTZ. The Soviet Union would like to block further production and deployment of the MX missile, along with other elements of the strategic modernization program. If the United States decides not to proceed with deployment of the MX, a key part of our modernization program, we would be signaling the Soviets that they can achieve their objectives through unilateral U.S. reductions and would thus remove a Soviet incentive to negotiate seriously toward the significant mutual reductions we seek in the Geneva negotiations.

MX VITAL TO GENEVA NEGOTIATIONS

Senator GOLDWATER. In your judgment, what effect would denying MX procurement funds for additional MX missiles in favor of maintaining a "warm" production line have on the prospect for effective negotiations?

Secretary SHULTZ. The MX is a necessary modernization of the ICBM leg of the Triad. It is not a bargaining chip for arms control negotiations. It is the actual strength of our deterrent as well as the demonstration that we are able and willing to carry through on our modernization programs that will provide the Soviets with incentives to negotiate seriously toward the significant reductions we seek. I believe denying production in favor of a "warm" production line would not convey our willingness to maintain our deterrent and would not have a positive impact on the negotiations.

QUESTIONS SUBMITTED BY SENATOR JOHN WARNER

U.S. ASAT TESTING

Senator WARNER. What would be the impact on our negotiating efforts if the Congress were to impose a moratorium on U.S. ASAT testing, or some other unilateral arms control constraint on U.S. programs?

Secretary SHULTZ. The U.S. ASAT program was undertaken in an effort to develop a deterrent capability to match the existing, deployed Soviet ASAT system.

The record in respect to unilateral restraint is clear: our unilateral restraint in strategic programs during the 1970s was met with a massive buildup of corresponding Soviet forces. Our determination to modernize has helped bring Moscow back to the bargaining table.

Verification of a negotiated ban or limitation on ASAT deployment would be very difficult. In addition, because the number of military satellites is small, even a few ASAT systems could have a decisive effect. We would, therefore, be at a distinct disadvantage if such a ban were negotiated and we had not tested such a system. Such a situation would allow the Soviets covertly to maintain their own proven ASAT weapon components while we were unsure of the capability of our technology which would be needed in case of a Soviet breakout. Moreover, other Soviet military systems—such as the GALOSH ARM system deployed around Moscow—have an inherent ASAT capability.

SPACE AND DEFENSE NEGOTIATIONS

Senator WARNER. Does the administration intend to use the upcoming Space and Defense negotiations as a forum in which to stem the erosion of the ABM Treaty? Will we insist that the Soviets dismantle the Krasnoyarsk battle management radar?

Secretary SHULTZ. A variety of Soviet actions over the last 10 years have eroded the foundations and the premises of the ABM Treaty. We intend to raise with the Soviet Union a number of their activities in this regard, including our deep concern over the continued construction of a ballistic missile early warning radar at Krasnoyarsk in violation of the ABM Treaty. We will press for corrective Soviet actions, while reserving the right to respond to violations of this type in appropriate ways.

QUESTIONS SUBMITTED BY SENATOR DAN QUAYLE

START

Senator QUAYLE. Do you consider the Soviet arms control agreement violations listed in the President's most recent Soviet arms control noncompliance report to Congress to be significant—do these violations jeopardize U.S. security interests?

Secretary WEINBERGER. The Soviet arms control violations are very serious and involve serious implications for national security. This compliance record must be taken into account as we study the upcoming decision on our interim restraints policy. Violations are even more significant than the immediate military consequences of the acts themselves. They raise questions about the integrity of the arms control process that may be far more significant than the short-term military impact.

Senator QUAYLE. Do the arms control treaties the Soviet Union has signed with the United States, as the supreme law of the land (the Constitution's own words), have at least the binding qualities of legal contracts, which if broken, are no longer binding?

Secretary WEINBERGER. The present situation, where the U.S. complies with its obligations and the Soviet Union does not, must be changed. However, our preference for eliminating that situation is not that the U.S. should follow the Soviets down the path of violating obligations, but that we should elicit compliance from the Soviets. In the upcoming negotiations, the United States will make clear to the Soviets that the U.S. expects both sides to be guided by the same standards of compliance.

SOVIET NONCOMPLIANCE

Senator QUAYLE. The President's report to Congress on Soviet noncompliance lists a half-dozen arms control treaties the Soviets have violated. Of the many violations detailed, which few have the United States protested longest and for how many years?

Secretary WEINBERGER. In January, 1965, the U.S. informed the Soviet Union that we had detected the venting of radioactive debris from an underground nuclear test, which is a violation of the Limited Test Ban Treaty.

The issue of testing of SAM components in an ABM mode was first raised with the Soviets in 1975. During 1973 and 1974, the U.S. observed tests in which a radar associated with the SA-5 SAM system was used to track strategic ballistic missiles during flight.

Since 1976 the U.S. has questioned Soviet adherence to the Threshold Test Ban Treaty which limits underground nuclear tests to yields below 150 kilotons.

Senator QUAYLE. Why should the United States continue to seek arms control agreements with the Soviet Union if it cannot get the Soviets to comply with the agreements it has already signed? Shouldn't our first arms control priority be to secure Soviet compliance to existing agreements? Shouldn't we pursue this objective before attempting to secure any new agreements? If not, why not?

Secretary WEINBERGER. In the new arms reductions negotiations in Geneva, the U.S. will take a strong position on compliance and verification. Absent a fundamental change in Soviet attitude and conduct, we cannot continue to hold ourselves to a higher standard of compliance than demonstrated by the Soviets.

There should be no mistake about our position on compliance: The U.S. is concerned about Soviet violations because we are most serious about arms control. We want an effectively verifiable agreement on substantial reductions. While we believe that Soviet conduct has undermined the arms control process, we hope the President's report and our efforts in Geneva, as well as support from our allies, will influence their behavior for the better.

SALT II LIMITATIONS

Senator QUAYLE. I have heard at least two interpretations of what our no undercut policy toward the SALT II limitations is. The first is that we will do nothing that might violate the SALT II limitations. The second is that we will take no action that is irretrievably in violation of the limits (e.g., procuring missile silos in excess of SALT limits, which cannot be destroyed easily, versus procuring test missiles in violation of the SALT limits, which can easily be destroyed bringing us immediately back into strict compliance with the Treaty). How do you interpret what a no undercut policy requires?

Secretary WEINBERGER. The no undercut policy requires that our actions during this period of interim restraint should not undercut existing arms control agreements.

The policy was established to promote an atmosphere of mutual restraint which is conducive to strategic nuclear arms negotiations while not jeopardizing U.S. national security. Our interim restraint policy was made contingent upon Soviet adherence to a comparable policy. We believe it is essential that all parties to agreements comply fully with them if arms control is to contribute to global security. Clearly, any future decisions about our own no-undercut policy would take fully into account the actions of the USSR in this regard.

SOVIET VIOLATION OF SALT II

Senator QUAYLE. The President's report on Soviet arms control noncompliance confirms that the Soviets have clearly violated the SALT II provision prohibiting more than one new type of ICBM and the encryption of telemetry on new ballistic missiles, and the testing and deployment of missiles of the SS-16 type. Yet, the U.S. continues to abide by the SALT II limits. How is such unilateralism in U.S. interests?

Secretary WEINBERGER. The President's interim restraint policy was established to promote an atmosphere of mutual restraint which is conducive to strategic nuclear arms negotiations while not jeopardizing U.S. national security.

The Department of Defense has acted to ensure that all programmatic and arms control options are preserved during this interim period. Consequently, no decisions have been taken which would foreclose or otherwise limit any of these options.

Our interim restraint policy of not undercutting existing arms control agreements was made contingent upon Soviet adherence to a comparable policy. We believe it is essential that all parties to agreements comply fully with them if arms control is to contribute to global security. Clearly, any decisions about our own no-undercut policy would take fully into account the actions of the USSR in this regard.

MX'S ABILITY

Senator QUAYLE. Secretary Weinberger, in your prepared testimony (page 5) you argue that MX will encourage the Soviets to reduce their reliance on large, heavily MIRVed ICBMs presumably because MX unlike our other missiles can place missiles such as the SS-18 at risk. Since the MX has warheads that have the approximate yield of our improved Minuteman III (with the Mark-12A warhead), isn't most of MX's greater ability to place Soviet missiles at risk due to its superior accuracy?

Secretary WEINBERGER. Yes, and this is of critical importance to deterrence and stability. The Scowcroft report correctly pointed out "Effective deterrence of any Soviet temptation to threaten or launch a massive conventional or limited nuclear war thus requires us to have a comparable ability to destroy Soviet military targets, hardened or otherwise . . . A one-sided strategic condition in which the Soviet Union could effectively destroy the whole range of strategic targets in the United States, but we could not effectively destroy a similar range of targets in the Soviet Union, would be extremely unstable over the long run . . . A one-sided condition of this sort would clearly not serve the cause of peace.

In order, then, to pursue successfully a policy of deterrence and verifiable, stabilizing arms control we must have a strong and militarily effective nuclear deterrent." Peacekeeper, with its superior accuracy, gives us the military effectiveness to rectify the one-sided condition by holding at risk those targets the Soviets value most.

MISSILE ACCURACY

Senator QUAYLE. In light of intelligence reports that Soviet silos are becoming much harder and our general policy of making our weapons as discriminate as possible won't improved accuracy for our missiles become more desirable in the future?

Secretary WEINBERGER. Yes, that's absolutely correct. Our efforts to improve the accuracy and capability of our current ICBM systems, coupled with future ICBM modernization programs (Peacekeeper and the Small ICBM) are in direct response to the increasing Soviet threat. Such accuracy improvements are also in line with our national deterrent strategy, which requires the capability to precisely apply force, and are necessary for the threat of retaliation against the Soviets' most valued warfighting assets. It is the capability to hold these assets at risk which causes great uncertainty for the Soviet attack planner, thereby enhancing deter-

rence. Additionally, accuracy is essential to meet our national policy of reducing the potential for damage to non-target areas.

Senator QUAYLE. Although developing penetration aids, decoys, and terminal fixing MARVs would be ineffective against robust defenses such as contemplated by SDIO, wouldn't it make sense to accelerate these efforts in order to dissuade the Soviets from precipitously deploying a crude ABM systems that would instantly negate our missiles' deterrent effect?

Secretary WEINBERGER. While we are sensitive to the problems associated with a Soviet breakout from the ABM Treaty, it does not necessarily make sense to accelerate countermeasures efforts against a hypothetical Soviet antiballistic missile (ABM) deployment. The Soviets can't "precipitiously deploy a crude ABM system that would instantly negate our missiles' deterrent effect,"—where "crude" is thought to mean effective against current U.S. missiles, including only terminal-phase intercept, and with no U.S. penetration aids. Achieving full operational capability would take time-time the U.S. could use to proliferate boosters or reentry vehicles in order to overwhelm the defense and deploy penetration aids. As for penetration aids, in the Advanced Ballistic Missile Reentry Systems (ABRES) program and other DoD programs some of the basic technologies required for penetration aids have been developed and put on the shelf pending future need. Other penetration aids are specific/ unique to the parameters of the ABM system being penetrated and can be provided once such a Soviet deployment is observed.

QUESTIONS SUBMITTED BY SENATOR PHIL GRAMM

SOVIET BUILDUP: 1979–PRESENT

Senator GRAMM. What is the extent of the Soviet build-up since the United States deployed our last major weapon system?

Secretary WEINBERGER. Since 1979 when the U.S. deployed the C-4 SLBM, the Soviets have introduced the following new types of strategic assets:

Sea-based systems: The Yankee-II, Delta-IV, and Typhoon Class SSBNs, the SS-N-17 and SS-N-20 SLBMs, and continued production of DELTA-III SSBNs;

ICBM systems: Modernized versions of the SS-18 (Mod-4) and the S-19 (Mod-3); and

Bomber systems: The BEAR-H bomber and the AS-15 ALCM.

In addition, production of the BACKFIRE bomber has continued at a rate of approximately 30 per year. At present, the Soviet strategic forces consist of:

Sea-based systems: 62 SSBNs (36 Delta, 23 Yankee, and 3 Typhoon) and over 2,500 Reentry Vehicles (RVs). (Note: these totals do not include 13 older submarines which carry three missiles each.)

ICBM systems: Upwards of 1400 ICBMs (520 SS-11, 60 SS-13, 150 SS-17, 308 SS-18, and 360 SS-19) and over 6,000 RVs.

Bomber systems: Over 400 bombers consisting of some 170 BEAR/BISON and approximately 240 Backfire. Note: U.S. systems deployed since 1979 include: ALCM, SLCM, the Ohio-Class (Trident) SSBN, and the introduction of the MK-12A warhead on 300 Minuteman ICBMs.

SOVIET BUILDUP: 1972–1979

Senator GRAMM. What is the Soviet build-up since the U.S. deployed our next to last major weapon system?

Secretary WEINBERGER. Since the deployment of the U.S. C-3 SLBM in 1972, the Soviets have deployed the following strategic assets (through 1979):

Sea-based systems: the Delta-I, Delta-II, Delta-III, Golf-III, Golf-IV, and Golf-V SSBNs, the SS-N-6 (Mod-2), SS-N-6 (Mod-3), SS-N-8, SS-N-8 (Mod-2), SS-N-18 (Mod-1), SS-N-18 (Mod-2), and SS-N-18 (Mod-3) SLBMs;

ICBM systems: SS-11 (Mod-2), SS-11 (Mod-3), SS-18 (Mod-1), SS-17 (Mod-1), SS-19 (Mod-1), SS-18 (Mod-2), SS-18 (Mod-3), SS-17 (Mod-2), SS-19 (Mod-2), SS-16 [1] and SS-17 (Mod-3); and

Bomber systems: the Backfire.

In addition, from 1972-1979, the Soviets increased their strategic warhead total by over 3,000 weapons.

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[1] Available information on the SS-16 is inconclusive, but indicates probable deployment.

QUESTIONS SUBMITTED BY SENATOR SAM NUNN

TESTING SPACE-BASED COMPONENTS

Senator NUNN. When, under the current schedule, would the U.S. be ready to test space-based components of a boost-phase intercept weapons system?

Secretary WEINBERGER. Testing space-based components of a boost-phase intercept weapons system would not occur in this research phase.

PREVENTING ARMS RACE IN SPACE

Senator NUNN. The January 8 communique that you and Foreign Minister Gromyko agreed to in Geneva states that one object of the negotiations "will be to work out effective agreements aimed at preventing an arms race in space." What does this mean?

Secretary SHULTZ. The objective of the Geneva negotiations will be to work out effective agreements aimed at preventing an arms race in space and terminating it here on earth, at limiting and reducing nuclear arms, and at strengthening strategic stability. The negotiations will be divided into three groups.

In the strategic and intermediate-range nuclear arms fora, we will seek radical reductions in the number and power of existing and planned levels of nuclear weapons. In the defense and space forum, we hope to engage the Soviets in a dialogue on the offense-defense relationship, the erosion of the ABM Treaty regime (as a result of Soviet actions such as the Krasnoyarsk radar), and the possibilities for moving toward a future strategic deterrent relationship in which defenses would play a greater role.

Clearly any transition to greater reliance on defensive systems would have to be carefully and cooperatively managed by both sides so as to maintain strategic stability as new defenses were deployed. We hope in Geneva to initiate a dialogue with Moscow which, should reliable, cost-effective and deterrence-enhancing defenses prove feasible, will facilitate a mutual transition toward an environment where such defenses play an increasingly important role.

Senator NUNN. Secretary Shultz, in a January 13 television interview, Foreign Minister Gromyko stated that if there were progress in reaching an accord preventing an arms race in space, the Soviet Union would be willing to reduce strategic armaments "sharply", but if there were "no movement forward in space questions, then it would be superfluous even to speak about the possibility of a reduction in strategic armaments".

a. Is the United States prepared to negotiate a ban or strict limits on deployments of strategic defense currently prohibited under the ABM Treaty?

b. If so, what would we demand in return?

Secretary SHULTZ. As you note, the ABM Treaty bans the development, testing, and deployment of ABM systems and components that are space-based, air-based, sea-based, or mobile land-based. Any decision by us to alter the terms of the Treaty would be preceeded by negotiations with Moscow.

We have said many times that SDI is not a bargaining chip. It is a research program, totally complaint with the ABM Treaty, and designed to answer a number of fundamental questions about whether new defensive technologies can contribute to and strengthen deterrence. The SDI research program will support the decisions of a future President and future Congress on whether to proceed with development of advanced defensive systems. We have no intention of trading away the right and the promise of this research. Moreover, the Soviets agree that research cannot be verifiably limited.

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN

SCOWCROFT COMMISSION

Senator LEVIN. Mr. Secretary, do you agree with the Scowcroft Commission that one of the most successful arms control agreements is the ABM Treaty of 1972?

Secretary SHULTZ. The ABM Treaty was signed at a time when neither the U.S. nor the Soviet Union could meaningfully reduce vulnerability to ballistic missile attack. It was assumed, therefore, that with defensive systems severely limited, it would be possible to negotiate comparable limits on strategic offensive forces and establish a reliable deterrence at reduced levels. It was further assumed that the constraints on ballistic missile defense would prevent break-out or circumvention, and that both sides would adhere to the letter and spirit of the agreement. We have

to recognize that these premises underlying the ABM Treaty have not been fulfilled, and the viability of the ABM Treaty regime has been eroded as a result. We intend to address this problem with the Soviets in Geneva in an effort to halt Soviet violations of current arms control agreements, including the ABM Treaty, and to put into place meaningful reductions on offensive nuclear forces that were envisioned when the ABM Treaty was signed.

Senator LEVIN. Mr. Secretary, do you agree with the Scowcroft Commission that "the implications of ballistic missile defense and the criticality of the ABM Treaty to further arms control agreements dictate extreme caution in proceeding to engineering development in this sensitive area"?

Secretary SHULTZ. The Administration recognizes the importance of the ABM Treaty. That is why one of our priorities in the defense/space forum in Geneva is to reverse the erosion of that treaty—a result of Soviet activities inconsistent with it.

DEFENSIVE WEAPONS SYSTEMS

Senator LEVIN. Mr. Secretary: Do you agree that defensive weapons systems, if paired with offensive systems, "can be viewed as fostering an aggressive policy" as stated in the President's Star Wars speech of March 23, 1983?

Secretary SHULTZ. At the earliest stages in our examination of potential defensive systems, we recognized that an effective defense, coupled with a strong nuclear offense and deployed without discussion and negotiation, could be perceived as aggressive. There is no better example of this than the Soviet Union today where massive deployments of both offensive and defensive weaponry continues unabated. I believe, however, that our objectives at Geneva offer hope for a better, more reliable security and a more durable peace. Even as we press for radical reductions in the number and power of strategic and intermediate-range nuclear weapons, particularly the more destabilizing MIRVed ICBMs, we intend to begin discussions with the Soviets on how—should new defensive technologies prove feasible—we could together make a gradual transition to a more stable and reliable deterrence based on a greater reliance on defensive systems. We recognize that such a future transition period would be a delicate time, but by managing the transition as a cooperative endeavor, and with arms control playing a critical role, we could avoid situations in which the mix of offensive and defensive systems would be regarded as threatening and destabilizing.

STRATEGIC DEFENSE

Senator LEVIN. In the hands of an aggressor, could not strategic defense increase his chances to accomplish the objectives of an offensive first strike—eliminating or significantly reducing an opponent's own strategic missile forces and their effectiveness—since the retaliation for that first strike could be neutralized by the aggressor's strategic defenses?

Secretary SHULTZ. You are speaking of the period of transition when both offensive and defensive systems are deployed and presuming that one Party has taken unilateral action to gain defensive superiority. That is certainly not what SDI is about. The ABM Treaty requires consultations, and the President has explicitly recognized that any ABM-related deployments arising from research into ballistic missile defenses would be a matter for consultations and negotiations between the Parties. We believe that such consultations, building upon the discussions with the Soviet Union we are even now initiating in Geneva, could assure a transition period which is cooperative, unthreatening and stable.

Senator LEVIN. Do you believe either side will allow the other to deploy strategic defensive systems which would render obsolete its offensive missiles without seeking countermeasures to defeat those defensive systems?

Secretary SHULTZ. We certainly are not trying to gain superiority, and our SDI research program is not designed to achieve that. One of the questions SDI is seeking an answer to, however, is whether new and future technologies can offer a defensive system which is cost-effective at the margins, i.e., it must be effective against an offense at less cost than it would take to develop additional offensive forces and countermeasures to overcome it. We believe that newly emerging technologies have great potential in this regard.

We also should remember that the Soviets for a number of years have been engaged in much more active and comprehensive research into advanced defensive technologies than the U.S. The SDI research, therefore, also represents a prudent hedge against the possibility that the Soviets would at a future time be positioned to make a breakthrough in defensive technologies and "breakout" of the ABM Treaty. Even as we and the Soviets continue with our respective research programs—and

the ABM Treaty recognizes the impossibility of verifying limits on research—we plan to engage the Soviets in discussions of how we can move together toward a more stable, less threatening relationship.

EFFECTIVENESS OF COUNTERMEASURES

Senator LEVIN. Would it be dangerous to us, or destabilizing, if the Soviets deployed countermeasures to our strategic defenses and we didn't do likewise to theirs?

Secretary SHULTZ. The effectiveness of countermeasures against strategic defenses is one of the issues that is being addressed in the technical research of the SDI program. It will obviously be a key element in any decision on the feasibility of the technologies currently being studied. If the technologies being researched eventually prove feasible, we would intend to introduce them into force structures in a cooperative manner, after discussions with the Soviet Union.

SDI OBJECTIVE

Senator LEVIN. Is our goal in SDI a ballistic missile defense which renders offensive nuclear weapons obsolete or is our goal a ballistic missile defense, which when combined with offensive weapons, would be an enhancement to deterrence?

Secretary SHULTZ. Our immediate objective in SDI is to determine the feasibility of new defensive technologies. Should they prove feasible, we would like to work with the Soviets to introduce defenses into the force structures of both sides, in a manner that would produce a more stable and reliable deterrent balance. Over the longer term, Foreign Minister Gromyko and I agreed in Geneva that our ultimate objective should be the eventual, global elimination of all nuclear weapons. Quite frankly, I do not see how this would be possible without some types of effective non-nuclear defenses to provide a hedge against possible cheating. Otherwise, neither side would have the confidence to give up its nuclear arms.

The conventional view of deterrence has been that it is a matter of posing to an aggressor high potential costs through the ultimate threat of devastating nuclear retaliation. But deterrence can also function effectively if one has the ability, through defense and other military means, to deny the attacker the gains he might otherwise have hoped to realize. As I have said before, our intent, if the technologies prove feasible, is to shift the deterrent balance to one in which nuclear arms are greatly reduced on both sides, and non-nuclear defenses play a greater role. We believe this would provide a far sounder basis for a stable and reliable strategic relationship.

ABM TREATY

Senator LEVIN. You have said we should reverse the erosion of the ABM Treaty that has occurred over the last decade. Please explain.

Secretary SHULTZ. A number of developments since 1972 have undercut the basic premises on which the ABM Treaty was based. These include: continuing technological developments, the failure to effectively limit offensive forces and establish a reliable deterrent balance at lower levels (Article XI of the Treaty), and Soviet activities which raise serious question about their continuing adherence to the Treaty.

In the Administration's reports to the Congress on Soviet non-compliance with existing arms control agreements, we have cited four areas of concern in Soviet compliance with the ABM Treaty: the construction of the Krasnoyarsk radar (which we believe is a violation of the Treaty), the possible development of a new Soviet mobile land-based ABM system, concurrent testing of ABM and SAM components, and Soviet preparations for deploying an ABM territorial defense. These activities have eroded the confidence in compliance which is essential to the arms control process and the continuing effectiveness of the ABM Treaty.

RADAR AT KRASNOYARSK

Senator LEVIN. Is the radar at Krasnoyarsk a violation by the Soviets of the ABM Treaty? What explanation have the Soviets given for the radar at Krasnoyarsk.

Secretary SHULTZ. We believe the construction of the large phased array radar at Krasnoyarsk is a violation of the ABM Treaty, which requires that such radars be located on the periphery of the country and oriented outward. The Soviets argue that the purposes of the radar are primarily space tracking and national technical means of verification, an explanation which US experts, after extensive study, have concluded is not credible.

SDI

Senator LEVIN. Messrs. Brzezinski, Jastrow, and Kampelman, in an article which appeared a few weeks ago in the New York Times, said that "the combination of defense against space missiles with retaliation offense in reserve enhances deterrence." Do you agree with that?

Secretary SHULTZ. The administration believes that the technologies being studied under the Strategic Defense Initiative offer real hope for a gradual transition toward the eventual goal of eliminating nuclear weapons. We have pointed out that if these technologies prove feasible the transition period would include deployment of a mix of both offensive and defensive systems. Our goal throughout such a transition period would be the maintanance of deterrence and enhancement of stability.

Senator LEVIN. Several of our allies have expressed concerns about the SDI Program, even though they support our doing some research in this area. They are concerned that if both the U.S. and the Soviets develop defenses against ballistic missiles, 1) it will make a conventional war in Europe more likely in view of Soviet conventional advantages; 2) it will neutralize the independent nuclear deterrent forces of the French and the British; and 3) it would permit a nuclear war to be fought in Europe without either the U.S. or Soviet homeland being threatened, thus "decoupling" our nuclear deterrent from protecting them.

To respond to the decoupling argument, the Administration has said SDI will also seek to develop defenses against ballistic missiles of shorter and intermediate ranges, as well as against the longer range ICBMs, SLBMs and IRBMs in the Soviet arsenal.

Even if SDI works against all ballistic missiles, no matter how short their range and flight time, Europe still would be vulnerable to attacks by Soviet bombers, Soviet cruise missiles and the thousands of Soviet artillery tubes capable of shooting nuclear shells. Doesn't this mean either the Europeans will have to spend much more than they already are to strengthen their air defenses, or they still could be a "decoupled nuclear battleground" for the superpowers?

Secretary SHULTZ. An effective defense against ballistic missiles would enhance deterrence by ensuring that a disarming first strike on our land-based strategic forces could not achieve its objective. By making war less likely and by increasing the survivability of our deterrent, our security and that of our allies would be enhanced. Thus, we view possible future defenses as strengthening the security relationship we share with our Allies.

We recognize that, if we are able to move to a strategic relationship based less on offensive nuclear arms and more on new defensive systems, we will also have to address the issues posed by shorter-range nuclear systems and conventional arms imbalances. The SDI research program will address these issues as well.

Senator LEVIN. Even if the Europeans improve their air defense more than they have so far promised to do, no one in the administration has yet said SDI could work against artillery shells of extremely short range. Unless you add that to the programs, Europe still could be an unprotected battlefield for nuclear artillery exchange. How will you address this concern about decoupling by our allies?

Secretary SHULTZ. Our allies and adversaries are well aware that America's security is inseparable from that of our allies. No technological development can alter that fact.

In a hypothetical situation such as you describe, NATO would continue to field forces to deter aggression at any level of conflict. Surely, if it proved feasible, reducing or neutralizing the threat from all but "extremely short range" nuclear weapons would be a development to be welcomed.

CONVENTIONAL WAR

Senator LEVIN. Europeans feel that another conventional war on their soil would be as bad as nuclear devastation. Without effective nuclear weapons to deter Soviet conventional attacks, if the Soviets have an SDI, why should the Europeans believe they are safer in a world where the United States and the Soviets have missile defenses?

Secretary SHULTZ. It would be premature to judge in detail the probable outcome of the SDI research program. One thing, however, seems clear: even under the most optimistic projections of the potential effectiveness of future defensive systems, it will not be possible for the foreseeable future to provide total protection from nuclear attack. Thus, for the foreseeable future, offensive nuclear forces and the threat of retaliation will remain the key element of deterrence.

Were we to decide to move toward a strategic relationship in which defenses played a dominant role, the need to ensure a firm and stable conventional balance

would become even more important than it is today. We have long sought and will continue to seek a reduction of the risks of aggression by conventional means as well as by nuclear arms. In a defense-dominated world, we and our allies would continue the energetic pursuit of measures by which we might counter and diminish the threat posed by conventional arms imbalances.

DEFENSE-RELIANT RELATIONSHIP

Senator LEVIN. Last month, the White House issued a pamphlet entitled: "The President's Strategic Defense Initiative," which said SDI represents systems "which threaten no one."

On the other hand, it has been reported that Secretary of Defense Weinberger has said that we would view a similar Soviet system as "one of the most frightening prospects" imaginable. How can our SDI threaten no one if theirs would be a frightening prospect?

Secretary SHULTZ. The President's vision of deterrence based on greater reliance on defensive systems runs parallel to this stated objective to significantly reduce the size and power of existing nuclear arsenals. We believe that survivable, cost-effective defenses would encourage rather than discourage arms reductions by showing the futility of deploying more offenses in the face of more effective defenses. We will be discussing our views with the Soviets on this subject in Geneva.

We have stated that our objective is not to seek superiority, but to achieve a more stable balance. Indeed, we would see any transition toward a more defense-reliant relationship as a cooperative effort with the Soviets, in which neither side would gain advantage.

Senator LEVIN. You say SDI is only a research project. But, if Congress approves those research funds, does the executive branch consider that approval the expression of congressional intention to support deployment of SDI (if research proves SDI to be feasible)?

Secretary SHULTZ. We have said repeatedly that the SDI research program is designed to provide a future President and a future Congress the technical knowledge to support a decision to perhaps develop and later deploy advanced defensive systems. We're asking Congress to support the SDI research program right now. Decisions concerning a possible future deployment cannot be made before the early 1990s. The executive branch has made no judgments concerning development or deployment, and we certainly can't interpret congressional funding of the research program in that way either.

Senator LEVIN. According to the Sunday, February 10 New York Times, European analysts have suggested that "when the U.S. Government starts signing contracts for studies of the system, the momentum towards deployment would become irreversible". Do you agree?

Secretary SHULTZ. That's just plain wrong. A number of SDI contracts have already been signed and there's not one of us who believes the momentum toward deployment is now irreversible. We'll just have to wait and see what the research results are. But this President is clear; if the new technologies cannot lead to systems that are cost-effective, survivable, militarily efficient, and which contribute to stability he would not favor their development and deployment.

SOVIETS ACTIVE IN ADVANCED BALLISTIC MISSILE DEFENSE SYSTEMS

Senator LEVIN. The October 23, 1984 edition of the Washington Post quoted Michael Havey, senior policy analyst for Presidential Science Adviser George Keyworth, a major supporter of SDI, that the Soviets would obtain SDI technology within 5 years of the United States getting it. Is this still the administration's position?

Secretary SHULTZ. The Soviets have, for some years, been very actively involved in research on advanced ballistic missile defensive systems. Indeed, we view SDI as, among other things, a prudent hedge against a possible Soviet breakthrough and unilateral deployment in this area.

We have stated clearly that we do not seek superiority or any unilateral advantage through SDI research. Through our discussions in the defense and space forum in Geneva, we hope to initiate a dialogue with Moscow which, should reliable, cost-effective and deterrence-enhancing defenses prove feasible, would facilitate a cooperative transition toward a relationship where such defenses played an increasingly important role.

Senator LEVIN. Last April, after a NATO meeting at which Defense Sectretary Weinberger discussed SDI with our European allies, a West German official told the Washington Post: "We got the impression that the administration has made up its

mind on producing these weapons and is not thinking about arms control first." Is this true that the administration has made up its mind to go forward and produce these weapons (assuming SDI is feasible) and has so informed our allies of this decision?

Secretary SHULTZ. That statement is certainly an inaccurate characterization of U.S. policy and, indeed, is not consistent with the overall tenor of comments in our close consultations with the FRG and other allies on this issue.

No decision has been made regarding the development, production, or deployment of weapons based on technologies in the SDI program; nor can such a decision be made until a number of basic scientific, engineering and policy questions have been addressed.

As we have stated to our allies and the American people, SDI is a research program that will provide a future President and a future Congress the technical knowledge necessary to support a decision in the early 1990s on whether to develop and deploy advanced defensive systems. As President Reagan has stated, in view of our treaty obligations, any SDI-related deployment would be a subject of negotiation.

SDI RETURNS SOVIETS TO GENEVA

Senator LEVIN. The President has said repeatedly that his SDI space defense program is the reason the Soviets have returned to the arms control negotiating table in Geneva. However, today you and Secretary Weinberger contend it is the continued existence of the MX ICBM program which has caused this to happen. How can two systems so inconsistent in their strategic goals, capabilities, characteristics and missions both have the same impact? Which program had more impact?

Secretary SHULTZ. We can only speculate as to the precise reasons that induced the Soviets to return to the table. For whatever reason, they found it in their overall interest to do so. Clearly, the continued demonstration of determination by the United States and its allies to modernize forces and provide for the continued protection of Western interests has been an inducement for renewed negotiations as the Soviets realized that they could not achieve their objectives away from the table.

Senator LEVIN. Air Force Chief of Staff Gen. Charles Gabriel told the committee on February 7, 1985 that SDI was not a factor in bringing the Soviets back to the bargaining table. Why do you disagree with him?

Secretary SHULTZ. I'll just have to let the Soviets speak for themselves. I can't offer a precise explanation for the Soviet agreement to open these negotiations. My personal view is that the Soviet Union would very much like to restrict our SDI program, but there were undoubtedly several other motivations as well, and I don't think there is any useful purpose served by speculating about them.

WEAPON SYSTEMS DEPLOYMENT

Senator LEVIN. If deployment of a weapons system is not in our national security interests, should we deploy it anyway if it applies pressure to the Soviets to negotiate or otherwise?

Secretary SHULTZ. The weapons systems that compose the administration's strategic modernization program are all in the President's judgment vital to the preservation of our national security. Thus, we do not believe the hypothetical situation posed in the question is applicable today.

SCOWCROFT COMMISSION

Senator LEVIN. The Chairman of the Scowcroft Commission has stated that the United States should continue its present policy of not undercutting the restrictions of the unratified SALT II Treaty, even when the seventh Trident submarine, the Alaska, begins sea trials later this year. In a January 21, 1985 interview, General Scowcroft said we should continue to comply with the SALT II restraints and even begin decommissioning U.S. nuclear systems to stay within those limits when the Alaska goes to sea. In general, he said: "There are restraints in the treaty on the Soviets which, however, modest, are better than having no restraints at all. It seems to me that we receive slightly more than we give in continuing to observe those restraints." Would you agree with this conclusion by the Chairman of the bi-partisan commission which recommended the President's strategic program?

Secretary SHULTZ. The administration has not yet arrived at a decision on what action to take, if any, when the Alaska goes on sea trials. There is no need at present to come to such a conclusion. That assessment will be made at the appropri-

ate time, and will include a judgment on the overall strategic situation, including such factors as Soviet compliance with existing agreements and East-West relations.

Senator LEVIN. Would the United States be less safe militarily if the Soviets deployed MIRVed ICBMs, MIRVed submarine-launched ballistic missiles (SLBMs) and heavy bombers and cruise missiles, and MIRVed missile warheads per missile in numbers above the present numerical limits in SALT II?

Secretary SHULTZ. That is a hypothetical question that cannot be answered in isolation. It would depend on the nature of those deployments, as well as the quantity and nature of U.S. strategic offensive forces. Certainly we seek to constrain the growth of Soviet forces.

While the United States is seeking significant reductions in strategic offensive arms as an objective in arms control negotiations, our focus is on reducing the most de-stabilizing weapon systems. Hence, in the abstract, it would be misleading to view increases in any single type of strategic weapons as being disadvantageous to the United States. Putting aside the question of abiding by existing agreements, and assuming significant reductions in destabilizing systems, and we would expect to see increases in some types of deployments, such as less destabilizing slow-flying systems. If accompanied by corresponding decreases in other systems (particularly MIRVed ICBMs), these deployments could contribute to the security of both sides.

SALT II

Senator LEVIN. Are the Soviets continuing to abide by these SALT II limits on MIRVed missiles, bombers/cruise missiles, and warheads per MIRVed missiles?

Secretary SHULTZ. The Soviets have not exceeded the 1,320, 1,200, or 820 subceilings established by SALT II, or the number of warheads per missile. We, of course, do not know whether they will continue to abide by these limits. There are, however, questions regarding their current compliance with other SALT II provisions. These are discussed in the reports on Soviet non-compliance that were submitted to the Congress last February.

ARMS CONTROL NEGOTIATIONS

Senator LEVIN. Do you plan to make use of the arms control negotiations beginning on March 12, 1985, in Geneva to pursue arms control treaty compliance issues with the Soviets and attempt to resolve them?

Secretary SHULTZ. The United States delegation to the nuclear and space arms control negotiations will raise our concerns about Soviet non-compliance with arms control agreements during their meetings in Geneva. We will also continue to raise these issues in the Special Consultative Commission and seek Soviet expianations and corrective actions. The next session of the SCC begins in April in Geneva.

Senator LEVIN. If you do plan to pursue these compliance issues with the Soviets in these negotiations, is there any advantage—both from a negotiating standpoint and a military standpoint—for the United States to continue to abide by these numerical limits in SALT II for some period of time yet—and at least through December 31, 1985?

Secretary SHULTZ. The question of whether the United States will undertake the necessary dismantlements to abide by the provisions of the SALT II Treaty is a matter that will be addressed at the appropriate time. The Department of Defense has been directed to take the necessary steps to keep our options open with respect to such dismantlements.

DECOMMISSIONING OF POSEIDONS

Senator LEVIN. General Scowcroft was asked the following question in his January 21, 1985 interview: "There is some indication that with the commissioning of the missile submarine *Alaska*, we may be exceeding our SALT II warhead limits. Should we start decomissioning some Poseidons in anticipation of that?"

He answered: "I think we should. The Soviets have been abiding by that provision and it seems to me that it's in our interest to do so as well."

Would you agree with this conclusion.

Secretary SHULTZ. The administration has not yet arrived at a decision on what action to take, if any, when the *Alaska* goes on sea trials. There is no need at present to come to such a conclusion. That assessment will be made at the appropriate time, and will include a judgment on the overall strategic situation, including such factors as Soviet compliance with existing agreements and East-West relations.

NATO ALLIES RELY ON UPHOLDING EXISTING AGREEMENTS

Senator LEVIN. Our Allies, especially those in NATO Europe, place great importance on continuing existing arms control arrangements and negotiations with the Soviets—not only for military reasons but to contribute to an overall positive climate in the East-West relations. Would you agree that our Allies would be very concerned if the United States decided to undercut these SALT II limits if the Soviets were continuing to abide by them?

Secretary SHULTZ. This is a purely hypothetical question. We have not undercut SALT II. On the contrary, as the President's most recent report on compliance indicated, the Soviets have violated their political commitment to refrain from actions that undercut SALT II. Our allies share our concern that, by impeding verification through encryption of telemetry data, and by testing the SS-X-25 ICBMs—a second new type of ICBM—Moscow is undermining the existing arms control regime.

ICBM AND SUBMARINE MISSILE DISMANTLING

Senator LEVIN. In his January 9, 1985 press conference, the President was asked whether we would dismantle ICBMs and submarine missiles, as we deployed more missile submarines, "in order to keep that SALT II agreement alive, even though it's not ratified." He answered: "Well, we have been holding to that and thought that it would be helpful in now what we're planning, going with. We have been eliminating some of the older missiles and taking out of service some of the submarines. We will continue on that ground." However, in his February 21, 1985 press conference, the President said he is still undecided whether we should continue to not undercut the SALT II numerical limits on MIRVed missiles. What has changed in the intervening 5–6 weeks between the President's statements to cause him to change his mind? When will the President decide whether the U.S. will continue to not undercut the SALT II numerical limits on MIRVed missiles?

Secretary SHULTZ. Nothing has changed; the two press statements are not inconsistent. His policy has been the same since he announced it on May 31, 1982: "As for existing strategic arms agreements, we will refrain from actions which undercut them so long as the Soviet Union shows equal restraint." The President will make a decision at the appropriate time regarding specific actions that may be required with respect to the relevant SALT II numerical subceilings.

[Whereupon, at 12 p.m., the committee adjourned, to reconvene upon the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1985

FRIDAY, MARCH 1, 1984

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

STRATEGIC DEFENSE INITIATIVE

The subcommittee met in open session, pursuant to notice, at 2:05 p.m., in room SR-222, Russell Senate Office Building, Senator John W. Warner (chairman) presiding.

Present: Senators Warner, Thurmond, Quayle, Wilson, Hart, Exon, and Levin.

Staff present: Arnold L. Punaro, staff director for the minority; Robert F. Bott, Douglas R. Graham, William E. Hoehn, Jr., and George K. Johnson, Jr., professional staff members; Karen A. Love, staff assistant.

Also present: Romie L. Brownlee, assistant to Senator Warner; Henry D. Sokolski, assistant to Senator Quayle; Mark J. Albrecht, assistant to Senator Wilson; DeForest Hamilton and Allan Cameron, assistants to Senator Denton; Janne E. Nolan, assistant to Senator Hart; Jeffrey B. Subko, assistant to Senator Exon; Peter D. Lennon, assistant to Senator Levin; and Phillip P. Upschulte, assistant to Senator Glenn.

OPENING STATEMENT BY SENATOR JOHN W. WARNER, CHAIRMAN

Senator WARNER. The subcommittee convenes in open session this afternoon to receive testimony from public witnesses on the President's strategic defense initiative.

This is the second hearing that the subcommittee has conducted on this important program, the first of which was conducted last week with administration witnesses.

I would like to welcome our witnesses this afternoon.

Our first witness is Dr. Zbigniew Brzezinski, well known to all of us. He was formerly Assistant to the President for National Security Affairs, as we all well know, and currently he is a respected authority on United States-Soviet relations and is a Senior Advisor at the Georgetown Center for Strategic and International Studies.

He recently coauthored an article on strategic defense, which appeared in the New York Times Magazine. I would recommend this article to all who are interested.

[See: Defense in Space is not Star Wars, p. 3616.]

Senator WARNER. Following Dr. Brzezinski, we will hear from Mr. Fred Hoffman, director of Pan Heuristics, a division of R&D Associates. Mr. Hoffman was the Director of the administration's Future Security Strategy Study, more commonly referred to as the Hoffman Report.

Dr. Brzezinski, we are pleased to have you. Please proceed as you wish.

STATEMENT OF ZBIGNIEW BRZEZINSKI, SENIOR ADVISER, CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES, GEORGETOWN UNIVERSITY, AND FORMER ASSISTANT TO THE PRESIDENT FOR NATIONAL SECURITY AFFAIRS

Dr. BRZEZINSKI. Thank you very much, Mr. Chairman.

I welcome the opportunity to participate in this discussion because it touches on an essentially important issue, namely, how do we insure national security in the next several decades ahead.

In reflecting on this problem, to which you and your colleagues are rightly giving a great deal of attention, one has to take as one's starting point the fact that we may now be entering an important new phase in the nuclear era, an important new third phase.

If one looks back at what has transpired in the American-Soviet relationship since the introduction of nuclear weaponry, one is compelled to differentiate between the first phase of that nuclear era, which started in 1945, in which the United States, in effect, had the capability to inflict unilateral damage on the Soviet Union, and could, thus, use nuclear weapons for the purpose of political intimidation as well as military deterrence.

MILITARY AND POLITICAL DETERRENCE

Indeed, the United States so did use its nuclear weapons.

The high point of that phase, which came at its close, was the American success in intimidating the Soviet Union in the course of the Cuban missile crisis.

But it was also roughly in the early 1960's that that first phase of unilateral American advantage came to an end, and we entered a second phase of the nuclear era, one dominated, indeed, by mutual deterrence in that both sides had the capacity to inflict massive and unacceptable damage on the other and, thus, had the capacity to deter the other from doing things which would jeopardize the national security of the parties involved.

I believe we are now entering a third phase of the nuclear era, one in which nuclear weapons are beginning, because of technological advances and dynamics, to acquire the characteristics necessary for their employment in war-fighting; this is to say, nuclear weapons are becoming so incredibly precise, insofar as their delivery systems are concerned, that they can, in fact, be used in military operations against military targets essentially for military purposes.

This carries with it, I believe, two new dangers which justify the serious concern that now is being given to the strategic equation.

The first is how do you maintain stability and security in the context in which both sides are acquiring very precise, time urgent, nuclear weaponry, which is susceptible to being employed in planned operations, designed to disarm the other side?

I am not saying that we are yet at a stage at which a disarming first strike is, in fact, feasible to the extent that any retaliatory response by the victim would be negligible. But we are clearly moving into a phase in which military planners can begin, for the first time, to consider seriously that such a possibility may arise, and at some point, particularly if the underwater deterrent becomes vulnerable, such a disarming first strike could, indeed, become a practical possibility.

This is novel. This situation did not exist in the 1960's or in the 1970's.

CRISIS AND STABILITY INTERSECTING

The second danger associated with it is the larger problem of crisis stability—crisis and stability intersecting, in which both sides increasingly possess time-urgent, essentially preemptive, first strike, potentially disarming nuclear weaponry.

This, too, tends to put a higher premium on preemption than used to be the case in the 1970's and 1960's.

In brief, we are entering the new, third phase of the nuclear era because of weapons dynamics, and, if one adds to that the ongoing acrimony and antagonism in the American-Soviet relationship, one is justified in asking very seriously how do we ensure our stability and security in the years ahead.

I believe there are, essentially, four ways of doing this. After all, politics as well as strategy, are the art of the possible, and not the selection of the ideal.

In my judgment, there are essentially four ways of doing it, and we have to choose, the President has to choose, and you, the legislative leaders of this country have to choose.

The first way is through comprehensive arms control. If we can get it, it clearly is the best way.

But let us be clear as to what comprehensive arms control really has to mean in the context as I have described it.

COMPREHENSIVE ARMS CONTROL

Comprehensive arms control is not only a matter of numerical ratios and quantitative symmetries, it is a matter of structuring a relationship between the United States and the Soviet Union in which through arms control we actually achieve and maintain a comprehensive balance. This in turn means that arms control, to be the solution to the dilemma that I have described, has to provide for greater stability and security for both sides, particularly by limitations on those offensive systems which are becoming increasingly destabilizing and which, by their technological characteristics, make the strategic relationship increasingly precarious.

Therefore, arms control has to address itself to those systems that are most precise, that are most susceptible for military use, that pose the greatest danger of either a disarming or preemptive strike.

If we can get such an arms control agreement, good and well. But how likely are we to get it?

I personally am quite skeptical. I believe that recent negotiating history does not give us too much comfort in assuming that we will get such an agreement quickly.

SALT NEGOTIATIONS

SALT I took 4 years to negotiate; SALT II took 7 years to negotiate; the complexities that we now face are greater than in the previous negotiations; and the Soviets throughout have not shown much willingness to be flexible precisely on those issues which are most germane to the problem that I pose, namely, either a disarming or preemptive engagement. Those are the forces that must be limited effectively.

Moreover, it does happen to be unfortunately the case that any such agreement which would have that desirable effect of enhancing security and stability would necessarily involve greater adjustments in Soviet force deployments than in our force deployments, given the fact that a higher percentage of the Soviet force deployment is primarily usable in a first strike. The Soviets have relatively little incentive to go in for an accommodation which inherently is asymmetrical unless they are given such incentive by us through some way that impinges upon their calculations. I will come to that.

Beyond this, what makes me skeptical about the prospects for a genuine and significant progress in arms control are three problems: verification, which has become much more difficult, and I need not elaborate on that to you since you know much more about it than I. But one example suffices, and that is the introduction of cruise missiles into our respective arsenals means that we face the problem of distinguishing between nuclear armed and nonnuclear armed cruise missiles. There is the problem of Soviet compliance with past agreements, which at least is troublesome, if not in many ways jeopardizing credibility. And there are ongoing geopolitical problems which affect the climate of relations.

Secretary Shultz said the other day that there should be no linkage. I agree that there should not be nor can there be formal linkage between negotiating arms control and geopolitical problems, such as Afghanistan. But even if there is no formal linkage, there is certainly political interaction in that, in a democracy such as ours, what is happening in a place like Afghanistan, which is troublesome to our moral conscience and which is geopolitically dangerous, is bound to feed back and constrict our negotiating options.

Thus these three problems, these three reasons—verification, noncompliance, and geopolitical conflict—further contribute to my low expectations regarding prospects for the first way of resolving the dilemma that I have posed.

I personally, incidentally, would favor as a way of stimulating some progress in arms control and overcoming the obstacles that I have identified an interim, short-term solution as a starter. I would like the United States in the arms control process to explore with the Soviets whether, instead of overcoming the whole syndrome of difficulties that I have described, both of us might not consider, in-

stead, a short-term, interim agreement in the context of which we would accept the Soviet proposal of about a year and a half ago to limit the number of launchers down to 1,800, provided the Soviets are prepared to buy one further constraint; because, by itself, a limit on launchers, if not accompanied by a limit on warheads, would be destabilizing.

LIMIT ON LAUNCHERS

But, if the Soviets were willing to match their proposed limit of 1,800 on launchers with a limit of, say, 7,500 on warheads, we would have a double aggregate—1,800/7,500—which could produce a relatively quick agreement, which might act as a catalyst for follow-on agreements, and would, at least, have some initially beneficial side effects beyond itself.

For example, any agreement for 1,800/7,500, with the freedom to mix for both sides, would have some desirable impact on Soviet megatonnage.

Nonetheless, I remain pessimistic about a resolution of the problem if instability inherent in the new type of weaponry now being deployed through comprehensive arms control. This leaves me with three other alternatives.

The first is the one that is often favored by those who tend to put all their eggs in the arms control basket, and that is essentially minimum deterrence.

Many of those who favor arms control as the best solution tend to go on and say that if we don't get it, in the meantime minimum deterrence is enough. This means that the Soviets continue modernizing their systems, deploying additional forces, and altering the strategic balance, and we, essentially, stay put on the grounds that we still have sufficient for minimum deterrence, this is to say, minimum retaliation.

I personally find this unacceptable, first, on political grounds, because it is going to produce a situation of such geopolitical asymmetry that, if not we, initially, then certainly our allies, and later ourselves also, are likely to be politically intimidated. Second, I do believe that there are genuine military dangers in such minimum deterrence, given the technological developments which I stressed in my opening remarks; namely, that at some point the Soviets, indeed, could reach a stage in which they could calculate that they are either able to disarm or effectively preempt through a first strike. This, in itself, has psychological, as well as political consequences.

Thus, I find the minimum deterrence school unacceptable, though many who support arms control would choose that as their alternative choice.

MUTUAL ASSURED DESTRUCTION

The third alternative is to go on with the existing doctrine, and that is mutual assured destruction: if arms control does not give us what we need, we buy security and stability through mutual assured destruction.

But what does this really mean, Mr. Chairman, in the conditions of the 1980's and the 1990's? It means that the Soviets will go on

with a large scale deployment enhancing their still predominantly first strike systems through the SS–24, SS–25, advanced submarine systems and, perhaps, even a breakout in the number of warheads, including those deployed in existing systems, such as the SS–18's, especially since they are already encrypting tests pertaining to fractionation. One has to ask why the encrypting of tests pertaining to fractionation with that encryption banned by SALT II unless they are fractionating? Thus, MAD means that on the Soviet side there will be a massive deployment of additional offensive systems. And on our side, too, we will have no choice but to move toward the deployment of also more advanced, more precise, more time urgent, more mobile, and, therefore, less verifiable offensive systems. We will go ahead with the MX. There is talk about the Midgetman. We will have to go ahead with the D–5, and so forth.

In this context, we are going to have to ask ourselves how much will all of that cost. Is it really going to be cheap? How much will the Midgetman cost if it is finally deployed in sufficient numbers? And what will be the sufficient numbers of the Midgetman if there is a breakout on the Soviet side?

If there is a breakout on the Soviet side in the number of warheads, we may have to deploy 1,500 to 2,000 Midgetmen. I submit to you that the problems we have had in finding an acceptable basing mode for the MX will pale in complexity when we begin to confront the problem of how to deploy large numbers of Midgetmen.

Last, but not least, are we going to be both more secure if mutual assured destruction entails the multiplication of more offensive systems on both sides? It will certainly kill arms control because mobile offensive systems will be extremely difficult to verify, it will be very costly, and it will be extremely unstable.

This brings me to the fourth alternative, the one that I actually favor, if we cannot get the first, if we cannot get comprehensive arms control.

MUTUAL ASSURED SECURITY

The fourth alternative is the one that I have called in some of my writings mutual assured security. I notice that a fairly prominent citizen of the United States has recently used the same terminology in a press interview that he had given. This means, essentially, combining the needed retaliatory force that the United States should retain under any circumstances, but which need not be composed to such a high extent as under MAD of first strike offensive systems; a needed retaliatory force which can inflict the necessary damage on the Soviet Union and on some of its military or high command installations with some degree of strategic defense. I use the words "some degree of strategic defense" advisedly because I am an agnostic when it comes to the proposition that we should have and can have a population-wide SDI. I do not believe we know enough as to make possible a judgment regarding its feasibility. We do not know enough about its costs.

But we do know something else; namely, that by the early part of the next decade we could have a two-tiered strategic defense system deployed which would have the capability, certainly—and I

use the word "certainly"—to interfere effectively with a Soviet first strike to the extent as to negate the military utility of any such first strike, and, thus, render it equivalent to a massive attack on the United States of the kind that the Soviets could have launched in the 1970's or that we could have launched against them in the 1970's, which is, in effect, mutual suicide, and, therefore, still preserves a system of deterrence.

A two-tiered SDI, accompanied by American retaliatory force, buys us the security and the stability that otherwise we should try to obtain through comprehensive arms control. Such a two-tiered ABM system would be based, essentially, on terminal defense, which we know we can have, and on the boost phase defense which, in all probability, we can have. But the probabilities are much better than 50 percent.

The combination of the two would so attrit a Soviet first strike that there is simply no way the Soviets could calculate what would be the military consequences of a first strike.

This would greatly enhance deterrence and insure security.

There are two further points to be made, Senators, and then I will stop.

Such a mix of American forces would not increase the American threat to the Soviet Union because it would in no way enhance our offensive forces and, in fact, I would be prepared to somewhat reduce our current emphasis on the acquisition of the kind of time urgent offensive systems that we will need under MAD if we do not get comprehensive arms control; and it would not prevent the Soviet Union from being able to retaliate against us in any case since it would be, essentially, a counter-first strike strategic defense, and not population defense.

COMPREHENSIVE ARMS CONTROL

Thus, the Soviets would still have the assurance that they do, indeed, have the necessary deterrence against us.

The second point is that such a deployment, and movement in that direction, is more likely than anything else to induce the Soviets at some point to consider seriously comprehensive arms control. By this I mean comprehensive arms control which tackles the problem which needs to be tackled in the 1980's and 1990's, which is not just a numerical problem but the question of how we distribute our respective strategic forces so as to threaten the other side with a disarming first strike as little as possible.

Hence, I believe that mutual assured security, combining a counter-first strike deployment with the needed retaliatory force, is the way the United States should go. I believe that your debates come at a very timely moment because the decisions that we make for the next 2 or so years will determine largely the shape of the strategic equation for the next two decades.

We are, as I stated at my outset, at a stage in which we are making basic choices. The choices that we made in the mid-1940's shaped the strategic environment through the mid-1960's. From the mid-1960's to the present, we have had a situation of mutual vulnerability. Unless we respond, we may move into a much more precarious era. But we do have the means now to choose a strategy

which enhances our security while, in fact, stabilizing the Soviet-American relationship and, perhaps, giving the Soviets an incentive of moving toward arms control.

Senator WARNER. Thank you, Dr. Brzezinski.

I will withhold my questions until after the other members have asked theirs. I will defer now to Senator Thurmond.

Senator THURMOND. Thank you, Mr. Chairman.

Mr. Chairman, I want to thank you for having this hearing.

President Reagan's Strategic Defense Initiative has begun an historic shift in emphasis from offensive forces to defensive forces that will redress a growing strategic military imbalance that the Western democracies would not be able to redress through the increasing production of offensive nuclear weapons.

The drumbeat of Soviet propaganda is increasing steadily in an attempt to stop our research and development. Obviously, if the Soviet Union does not like it, then it is a safe bet that the Strategic Defense Initiative is definitely in our best interest.

But, unfortunately, there are those critics who want to keep the heavens free from militarization and they want to continue to rely on a defunct strategic doctrine based on a concept of mutual vulnerability, a concept which the Soviets never have and never will accept.

Anybody who thinks that the heavens have not already been militarized has never heard of satellites and must believe that warheads are delivered by the post office.

Mr. Chairman, I would like to point out that many critics of the strategic defense initiative who are opposed to these destabilizing defensive measures because of a preferred reliance on offensive weapons for deterrence take the opposite approach to chemical weapons: when it comes to chemical weapons, a credible retaliatory capability is destabilizing, so we should only spend money on defensive measures.

Well, their logic escapes me.

Mr. Chairman, I just have a few questions for Dr. Brzezinski.

Dr. Brzezinski, I want to thank you for appearing here today. It is a pleasure to see you again and to have you here and to get your counsel.

DESTABILIZING DEFENSIVE MEASURES

Dr. Brzezinski, we hear over and over that the strategic defense initiative is destabilizing. Would you give us your views on this very briefly.

Dr. BRZEZINSKI. Basically, if a comprehensive, populationwide strategic defense system were deployed only by one side and were not available to the other side, one could make the case that it would be destabilizing because it would create a situation of almost complete invulnerability on one side and almost complete vulnerability on the other.

This could be destabilizing, although I, frankly, do not believe that it would be possible to deploy a comprehensive, populationwide defense system without the other side rapidly moving in the same direction as well.

But what I favor, because I believe it is feasible as well as strategically desirable, is not a populationwide strategic defense, but a strategic defense deployment designed to counter a first strike. This is not destabilizing because it does not enhance your offensive power, nor is it destabilizing because it does not deprive the Soviets of their retaliatory capability against our population.

It simply deprives them of the hypothetical possibility of calculating that they could actually gain a significant military edge by attacking the communications, the command centers, and the strategic forces of the United States.

This situation I think has to be precluded.

I also believe, Senator, that we are now at a stage in which we really genuinely need a bipartisan approach to this issue. I think the Democratic Party would be making a very major mistake if its position on strategic issues involved either its commitment to a nuclear freeze, which is essentially escapist, or to minimum deterrence, which poses the danger of a genuine imbalance developing in the 1990's and the year 2000.

I think the Democratic Party, which is looking for a centrist defense strategy, would do well, in my judgment, to embrace the view that some strategic defense designed to inhibit a first strike, with an emphasis on retaliatory force by the United States, perhaps with greater emphasis on cruise missiles than on the Midgetman, is the kind of strategy we should be pursuing since it offers the best inducement of getting a good comprehensive arms agreement with the Soviets and, in the meantime, of enhancing stability.

MUTUAL VULNERABILITY

Senator THURMOND. Dr. Brzezinski, do the Soviets accept the concept of mutual vulnerability?

Dr. BRZEZINSKI. I think the Soviets realize it exists, but I think it is also the case that the Soviets are doing much more than we to reduce that mutual vulnerability. I think there is a great deal of evidence to confirm the proposition that the Soviets are doing two things which we are not doing and which are designed to reduce that mutual vulnerability. The first is much more hardening and camouflaging of their own strategic forces, increasingly now with greater reliance on mobility; and, second, and much more important, is a highly sophisticated and ambitious program to safeguard their political elite in the event of conflict—this is to say an ambitious program of providing hardened, survivable, and, in many cases, deceptively hidden facilities to insure survival of the top echelons, in the tens of thousands, of the top Soviet political elite. This indicates at least some degree of interest in making that mutual vulnerability somewhat less symmetrical.

Senator THURMOND. Dr. Brzezinski, do you believe we should share the technology of the strategic defense initiative with the Soviet Union?

Dr. BRZEZINSKI. I don't really believe that is a practicable idea because the strategic defense technology is so intimately related to offensive technology as well. It involves, for example, enormous dependence on the most advanced, sophisticated, and complex systems of computation, without which the strategic defense would

not be feasible. And yet, these same systems are terribly important to the enhancement of offensive capabilities.

So I do not believe, as a practical matter, that it can be shared.

Beyond that, I think the Soviets have demonstrated that, in the military field, they can do reasonably well on their own, and I would leave it to them to develop their own strategic defense. They are doing so already, to some extent, to a greater extent than we. I think it is quite clear that they are already at work on a strategic defense system which would have some effectiveness in interfering with an American first strike.

SOVIET STRATEGIC DEFENSE SYSTEM

Now this may seem unreasonable to us, given the relatively low percentage of our forces that are suitable for a first strike. But the Soviets have made some progress in the development of a strategic defense system, a rudimentary ABM, which would have some capability to interfere with our first strike.

Hence, I do not see that, from a practical or a strategic point of view, sharing that technology with them makes much sense.

Senator THURMOND. Thank you very much, Dr. Brzezinski.

Thank you, Mr. Chairman.

Senator WARNER. Thank you.

Senator Hart.

ABM TREATY

Senator HART. Dr. Brzezinski, did you at the time support the ABM Treaty?

Dr. BRZEZINSKI. I supported it without too much enthusiasm. It seemed to me that we were foregoing essentially potentially useful technological development at our end, and I did not have too much confidence at the time that the Soviets would similarly so forego it.

But I did not feel too strongly about it because the ABM Treaty, when it was reached in 1972, had two important qualifications associated with it, one implicit and one explicit.

The implicit one was that it was reached at a time when neither side really had much capability for a militarily disarming first strike. We were dealing essentially with population vulnerabilities and, at that time, it was quite clear to me that no ABM that was feasible in the early 1970's could effectively protect populations.

Second, the ABM Treaty, as you doubtless know, Senator, has a provision in it to the effect that it will lapse if there are no significant limits on offensive systems agreed to in subsequent years. And I fear that no such limits have, in fact, been established and, therefore, the treaty has a self-terminating provision in it.

Senator HART. Well, if the Senate had ratified the SALT II Treaty, we would have at least some limits—although not as extensive as we might have hoped.

Dr. BRZEZINSKI. That's right. I supported SALT II, and I still think SALT II is clearly an improvement on SALT I.

Senator HART. I don't understand the respect in which we gave up certain technologies by agreeing to the ABM Treaty. We are permitted to continue research and development and, indeed, have, as you well know. President Reagan did not invent ballistic missile

defenses. We spent tens of billions of dollars on research, including under the Carter administration, on defensive technologies.

Can you account for the fact, given your enthusiasm for this initiative now, that there was not greater enthusiasm for it under the Carter administration?

Dr. BRZEZINSKI. Well, first of all, I don't think we spent tens of billions of dollars on ABM research in the Carter administration.

Senator HART. No; over the past decade or decade and a half.

ABM RESEARCH

Dr. BRZEZINSKI. Well, I would be very interested to see whether it would add up to tens of billions of dollars for ABM research. I rather doubt that it would.

The fact is that we have slowed down. We have maintained some research in some areas, but research without some deployment and some testing obviously is not the same thing as the latter, and it does give you a much more enhanced capability. The Soviets have moved forward.

The reason I did not favor actively some form of strategic defense in the Carter administration was that at the time there still seemed to be some hope that we could reach with the Soviets a comprehensive arms control agreement which would have a significantly inhibiting effect on the acquisition and deployment of the kind of systems that in the course of the 1980's and 1990's may become potentially more destabilizing. As long as that route was open, I preferred it.

In my testimony today, Senator, I outlined four ways of maintaining security and stability. I did say that the first is the best, and that is comprehensive arms control. But I am now increasingly doubtful that we will get it, and, therefore, we have to make a choice of what are some of the less attractive alternatives.

I clearly come out, in that context, for some SDI with a retaliatory capability.

Senator HART. Given the uncertainties in the scientific and technical communities about perfecting much of the technology involved in the entire initiative, how do you account for your enthusiasm and, in fact, as I understand it, your commitment to going forward with what I believe you called the first two levels——

Dr. BRZEZINSKI. Right.

Senator HART. Ambassador Nitze, as you know, gave a speech the other day which I thought very carefully defined the necessary preconditions to go forward with deployment of the SDI. His was a speech characterized throughout by the use of conditional words: "if" this technology works out, "if" we are able to do certain things, "if", in fact, the cost effectiveness is such that it is cheaper to build defenses than to overwhelm them with offenses, then this is something that ought to go forward.

As I understand your testimony today, you pulled out all the stops and say "go."

Dr. BRZEZINSKI. Well, Senator, first of all, let us not confuse enthusiasm with confident judgment. There is a difference between the two.

I am confident of the view that a certain form of strategic defense is possible, and I am confident of the judgment that it is strategically desirable. I would not confuse that with enthusiasm, which is more a state of emotion than of mind. Hopefully, I am being reasonably cerebral about this thing, even though we may have a difference of opinion.

Now, as far as Ambassador Nitze is concerned—and I have read his speech very carefully, as have you—it is quite clear that that speech talks about the totality of the President's strategic defense initiative. He very rightly says that there are a great many uncertainties, a great many things yet to be researched and to be developed and, therefore, there are a great many questions to be answered. I wholly agree with that.

I said earlier, maybe before you came in, that I am an agnostic when it comes to the President's strategic defense initiative insofar as a comprehensive population defense is concerned.

STRATEGIC DEFENSE CAPABILITY

I am, however, reasonably confident, on the basis of scientific judgment, and I believe that same conclusion was voiced by three witnesses yesterday who do not share some of my strategic views. I am reasonably confident, and that point of view is shared by these three witnesses, namely, Mr. Brown, Mr. Schlesinger, and Mr. Scowcroft, that a limited strategic defense capability is feasible. And even then there are differences in degree of certainty.

In my earlier testimony, which was not written, which I gave off the top of my head, but which I still recall reasonably clearly, I said that we are quite certain we can have an ABM system in the terminal phase, and it is very probable that we can have it in the boost phase. I believe the weight of technical evidence is in favor of that proposition.

We are much less certain about the post-boost phase, and we are much less certain about the mid-course phase. That is where most of the difficult research needs to be done. But there is relatively little uncertainty about the terminal phase and the boost phase. I happen to believe that if we cannot get a comprehensive arms control agreement, that is a better alternative to the other two.

Now, I do not know whether you favor piling up more offensive systems, Midgetmen, MX's, D–5's, Stealth, and cruise missiles, or whether you believe in minimum deterrence. But I believe that the combination of strategic defense with a retaliatory force which is less threatening to the Soviets than under MAD, is, in fact, the best way to buy security and stability.

Senator HART. And when did you become convinced of this?

Dr. BRZEZINSKI. In the course of the last several years increasingly, and particularly in the course of the last year, after the issue was forced into the public domain through the President's initiative of March of 1983, which at first I greeted with some degree of skepticism, but, as I began to look into it much more deeply and began to examine what aspects of the President's initiative are still uncertain and which aspects of it do offer some degree of confidence that they are feasible, I began to reflect on what combina-

tion of U.S. posture in the 1990's and the year 2000 might be most stabilizing if we cannot get comprehensive arms control.

Senator HART. Finally, Dr. Brzezinski, given the fact that there is now an apparent bipartisan consensus that we are bumping our heads on the ceiling of the defense budget and have been for the last 2 or 3 years, would you give the subcommittee an estimate of what production and deployment of this limited defense capability might cost and what you would be prepared to give up in terms of other military priorities to achieve it?

Dr. BRZEZINSKI. Yes; let me say, very frankly, that my estimates are going to be very general. They are, I understand, within the ballpark, but don't hold me accountable for every dollar because I am not prepared to defend it with the greatest degree of precision.

I would say that deployment between now and 1995 of a two-tiered SDI, designed only to negate the possibility of a first strike, would cost no more and probably less than the deployment of the needed Midgetmen and other offensive enhancements which would be required in the event there is no comprehensive arms control agreement.

More specifically, the system that I am talking of would cost approximately $15 billion for the terminal phase and approximately $45 billion for the boost phase. Probably the estimates are a little higher than actually might turn out to be the case, but I say this with real diffidence because that rarely turns out to be the case, I realize.

That is roughly the range. I submit to you that, if we go into the kind of force enhancement that we will have to go to if we do not get comprehensive arms control, if the negotiations don't yield positive results, if there is a major Soviet expansion and breakout, then the cumulative costs of the Midgetman and of the MX, plus other systems, and maybe even acceleration of the D–5, will in all probability be considerably above the estimate that I gave you.

Senator HART. Thank you.

Thank you, Mr. Chairman.

Senator WARNER. Senator Quayle?

Senator QUAYLE. Thank you, Mr. Chairman.

First of all, Dr. Brzezinski, I would like to congratulate you on an article that you and Mr. Kampelman and Mr. Jastrow wrote for the New York Times Magazine about 3 or 4 weeks ago. That was one of the best articles summarizing the feasibility of where we are going to go on what you have referred to as a limited SDI. I certainly thought it was a very insightful and helpful article for me, and I know others share that feeling.

ARMS CONTROL NEGOTIATIONS

Let me first ask you a general question about arms control and the negotiations that are going to be underway with the three track approach of INF, strategic, and space defense. You know the Soviet Union perhaps better than anybody and how they are going to gauge the American public, and you know what the national security requirements are for our country. What are your expectations for the talks going on in Geneva? Do you foresee a settlement

down the road or do you think this thing is going to be long and protracted and complicated?

What is your general assessment?

Dr. BRZEZINSKI. I think it is going to be long and protracted, and very difficult, not only because of ill-will or anything of that sort, but because of the sheer complexity of the issues.

When I reflect on the kind of issues we had to deal with in SALT II and when I think of the new systems coming down the line, of the greatly magnified problems of verification, I am really overwhelmed by the difficulties that our negotiators and the Soviet negotiators will face. So I am, on the whole, of the view that it is going to be very, very tough sledding.

This is why, incidentally, I favor an interim, breakthrough solution, if we can have one. This 1,800/7,500 formula that I have given you could be one way of accelerating the process and keeping momentum going.

But, beyond that, I think we have to convince the Soviets in a tangible way that they have a stake in an accommodation which deals with the problem of the offensive, trigger-quick, time urgent systems. We are not going to give them that incentive unless we deploy offensive systems ourselves, such as the MX, and are prepared to deploy later the Midgetman and the D-5—and that would be very costly—or unless we say to the Soviets that we have another way of negating the utility of your massive investment, depriving you of the possibility of ever exercising it, which is a limited, two-tier counter first strike SDI. Either case, then, will somewhat enhance the probability of a large accommodation.

So, I would say, one, long SALT negotiations; two, let's see if we cannot get a breakthrough with an interim agreement limited to two aggregates; three, convince the Soviets we are prepared to negate the advantage they have gained through their specific types of deployments by either mutual assured destruction, which I do not favor, or, preferably, the counter first strike SDI.

SDI IMPLICATIONS

Senator QUAYLE. OK, let's look at the SDI and look at some of the implications, the positive implications that the SDI could have for arms control.

If we continue to move ahead, and if we deploy perhaps within the next decade, and if the Soviets are convinced that we have this technology and are going to go ahead and therefore, many of their ballistic missiles, land-based ballistic missiles and also sea-based ballistic missiles are going to be exceedingly vulnerable and we are going to be able to get them either in that boost phase or in a later phase would not the SDI really change the military mix that we know of today? Wouldn't our ballistic missiles really become somewhat obsolete? Aren't we in fact, probably going to reduce the amount of ballistic missile megatonnage that the Soviets can effectively draw down against the United States?

Dr. BRZEZINSKI. Well, if we do, that would be all to the good.

ARMS CONTROL DISCUSSIONS

Senator QUAYLE. That is what I am trying to get at. I would like to get from you some of the positive implications that SDI could have on the so-called generic discussion of arms control because arms control is very important in today's modern day discussions from a political point of view.

I don't know where we are going to go, and you have already pointed out the complexities of the situation.

Dr. BRZEZINSKI. Senator, let me answer in this way.

The purpose of arms control is to enhance stability and security for both sides. Therefore, if we move toward a limited SDI, we are really not doing anything to threaten the Soviets more because we are not gaining any additional advantage, unless we accompany even my limited SDI with a crash program of enhancing our first strike offensive systems. I would not advocate that, and I don't think we would. For one thing, we probably would not want to spend the money on it.

So, if we go for the SDI, we probably would not need as many Midgetmen, maybe we would not need them at all, we can emphasize cruise missiles more, and Poseidons and so on.

Now, what about the Soviets? The Soviets do not have a choice. They can try to overwhelm our SDI by deploying more offensive systems. But what are they accomplishing by doing that? They are doing two things.

FIRST STRIKE CAPABILITY

First, they are signaling to us that they want to retain a first strike capability, which is a very ominous warning, and which certainly will encourage us either to step up SDI or to deploy more counteroffensive systems.

So, they are not going to gain anything from it except to signal more clearly what they presumably would not like to signal to us, that they want to have a first-strike capability against us, which is very dangerous.

In the alternative, they may move toward greater sea deployment, which is fine from our point of view. That is all to the good and I would welcome that. Suppose they move to some SDI? Excellent. I would not object to it. If it is a counter first strike, since we are not planning one and are not deploying forces for a strike, I would not object to it.

Third, they may say to themselves that this is too expensive for us and for the Americans, but it is more expensive for us because we have half the GNP of the Americans, in which case let's go now for a real arms control agreement which deals with the systems that are troublesome to both of us. The Americans will forego the SDI. They will reduce or terminate the Midgetman, they will put a cap on the D–5, and we will do the same with the SS–18, SS–19, SS–24, and SS–25.

That is terrific. That is where we should be heading. But we are never going to get there if in this country we keep saying to ourselves no MX, no Midgetman, minimum deterrence and no SDI—which happens to be the program of a significant portion of the American body politic. That is a program which objectively perpet-

uates the arms race and which, in fact, makes the strategic situation more dangerous.

Senator QUAYLE. If the Soviets are convinced that we can have some technological edge in SDI, and they see that it is going to work even on a limited basis—I am talking about the limited SDI and not about covering the whole country, including the entire population—don't you think that probably their most logical response would be to say OK, we can work in the arms control arena, but we are going to have our own SDI? Haven't they, in fact, really been moving in that direction?

If that is the case, aren't we going to get away from a hair-trigger offensive situation?

Dr. BRZEZINSKI. Right.

Senator QUAYLE. Aren't we going to have more stability ultimately? Aren't there going to be positive implications for arms control overall—if, in fact, we move this way—rather than negative implications, which a lot of critics say we are going to get with SDI?

Dr. BRZEZINSKI. Well, you are kind of spoon feeding me. [General laughter.]

Sure. Of course.

Senator QUAYLE. Well, we will mark it down, then, as agreement. [General laughter.]

Let the record show that there was emphatic agreement with my statement. I want to make sure that I said what I really meant.

Dr. BRZEZINSKI. Well, let's use the word "enthusiasm." There was enthusiastic agreement.

ABM TREATY

Senator QUAYLE. OK, enthusiasm.

Dr. Brzezinski, in response to Senator Hart, you talked a little bit about the ABM Treaty. You said that if, in fact, we do not get certain limitations, the treaty itself would be self-expiring.

Aren't we at some point going to have to face the fact that the ABM Treaty, which we signed a long time ago, that it and its basic principles are no longer valid? Aren't we going to have in some way to either renegotiate it or let it expire?

Dr. BRZEZINSKI. I would favor, even in the present arms control negotiations with the Soviets, saying two things to the Soviets: One, let's have a quick fix interim agreement along the lines I sketched out; and, two, let's begin serious talks about some revision of the ABM Treaty because it would be good for both of us if we can widen the ABM to include the NCA, some of the key ICBM clusters, SLBM bases. Both you and we will be better off for it. Then, on that basis we can scale down particularly those offensive systems that are most threatening to each of us.

I would favor that.

I think we have to start talking to the Soviets. But if we don't talk to the Soviets or the Soviets rebuff us, the ABM Treaty clearly says, explicitly—and President Nixon recently drew my attention to this fact—that it has to be accompanied by ongoing agreements limiting offensive systems. Otherwise it lapses.

I think we have to face up to the fact that there is nothing sacrosanct about the ABM Treaty. Some people are elevating it to "holy cow." It is no holy cow. It happens to have been an agreement which makes some limited sense in the strategic conditions of the early 1970's, given the nature of the weapons systems then. But it makes much less sense right now.

Senator QUAYLE. Thank you, Mr. Chairman.

Senator WARNER. Mr. Exon?

Senator EXON. Thank you, Mr. Chairman. Dr. Brzezinski, I am just delighted to have you here today. We are friends, have met on frequent occasions, and I rely a great deal on your expertise, testimony and experience in this area. I think it is certainly helpful to me and I am sure for the whole committee.

The first question I am going to ask you is not to put you down but to try to set the record straight on where you are coming.

MAJOR WEAPONS SYSTEM

Has there ever been a major weapons system that has come out of the Pentagon, save the B–1, that you have not supported in one form or another?

Dr. BRZEZINSKI. Yes; you just mentioned one—the B–1.

Senator EXON. I said except for the B–1.

Dr. BRZEZINSKI. Oh, except the B–1.

Well, I have had some reservations, for example, about the deployment of additional large aircraft carriers, and that would qualify as a large weapons system, would it not?

Senator EXON. I think Senator Hart would agree?

Senator HART. Are those the Hart carriers? [General laughter.]

Senator EXON. But he has had his chance already.

Dr. BRZEZINSKI. I cannot think of any weapons system that is produced in the farm belt. [General laughter.]

I have had reservations about the B–1, about the large-scale aircraft carriers, to give you two examples.

Senator EXON. You people who produced weapons and put them around, you put the weapons in the farm belt. [General laughter.]

Senator HART. That is because they are silos. [General laughter.]

Senator EXON. Well, I think we have established that you have not been one of the great doves but you have been an advocate of a strong defense. I compliment you for that. I agree with you that the freeze won't work.

I, too, have supported a strong defense. The only major weapons system that I have ever opposed is the MX missile. Since you had a great deal to do with the development of the MX missile in its early stages, and I consider you one of the fathers of the MX missile. I believe you brought forth that missile system basically on the fundamental ground that it was necessary because the Soviet Union had suddenly, according to our intelligence, significantly improved the accuracy of their missiles and were building more of them. I believe you basically felt that our Minuteman II's and III's were, therefore, vulnerable to a first strike from the Soviet Union. So you came up with the MX missile program.

During your tenure as National Security Advisor I was on this subcommittee and I supported the MX Program based in a mobile

basing system, which I think was an inherent part of the plan from the very beginning.

MX MISSILE SYSTEM

During those early days, when you were one of the leading advocates of the MX missile for the reasons I have just stated, would you have supported the development of the MX if you knew that in 1985 we would significantly change the deployment of that missile? Would you have been in favor of development of the MX if you knew in the late 1980's that we were going to take that missile and put it right back in the vulnerable silos that we were concerned about so much that we thought we had to develop a whole new MX system and make it mobile in deployment?

Would you have supported it then if you knew what you know now?

Dr. BRZEZINSKI. No; I would not have, Senator. I know this is an important question that you are asking, and I know there is a great deal behind it. Therefore, let me elaborate.

No; I would not have supported it if I had known that it would be deployed in an essentially vulnerable mode and in much reduced numbers. But I would in that case have desperately searched for some other alternative which we would have deployed because I do believe that it is simply intolerable for the United States to be put into a position in which the Soviets are able to deploy large numbers of essentially first strike, highly precise, effective systems, and we are becoming more vulnerable to them. I would have either thought of some other alternative if I knew this would happen, such as a crash program on the D–5, or had I known about the SDI, some crash program on a counter first strike SDI.

But, being where we are today, in particular on the eve of the arms control negotiations, and given the fact that we do not have the alternative of which I have spoken, I certainly would support the MX right now, unhappy as I am about the basing mode and so forth. But, given the fact that in the intervening 5 years we have not developed an alternative, and given the fact that we are entering very difficult negotiations, I would support the MX now with some reluctance and misgivings.

Senator EXON. Then, Dr. Brzezinski, is it fair to say—and I am not trying to put words into your mouth, but am trying to understand as much as lay people can understand, is it fair to say that the MX has not progressed as you had hoped it would have, as far as a deployable mode is concerned; but, since we have gone this far with it and since we have had the research and development on it, you think, under existing circumstances, that it is best to go ahead and produce them and put them into vulnerable silos but that gives you great cause for concern?

Dr. BRZEZINSKI. That is correct, because there may be more alternatives in the future than simply one where it is necessary for such a system to ride out a Soviet attack. Given the fact that in the intervening years during which we have dillied and dallied and changed deployment modes and fooled around with the numbers, and have not developed any alternative to it, I think we are better

off proceeding with than terminating this, especially given also the fact that the arms control negotiations are coming up.

Senator EXON. You are concerned about the heavy throw-weight, the numbers that the Soviets have on their land based missiles. But I have not heard you say much today about other systems that we have.

Is it a legitimate criticism that sometimes we start focusing so much on the Soviet land-based missile strength where about 75 percent of their nuclear force is in that we tend to sometines ignore the strength that we have in the other two legs of our triad?

Dr. BRZEZINSKI. Well, it certainly would be wrong to ignore the strength that we have. But it is also very important to differentiate the uses to which these alternative force postures can be put.

The fact is that that overwhelming force that we continue to have, which is often ignored, is essentially a second strike force, and very little of it is capable of being used in a disarming first strike.

As I stressed in my opening remarks, we are not yet in a phase in which a disarming first strike would take place. But we are in a phase in which particularly the Soviet side is acquiring at a reasonably impressive rate weapons systems that gradually do give it potentially a disarming first strike capability.

That is worrisome; but it is a worry that is focused on the future and not on the immediate situation.

TITAN MISSILE SYSTEM

Senator EXON. Given the superior strength in land based ICBM's of the Soviets, do you think it is wise for us to be phasing out that nine megaton Titan II weapon that we have before the MX is deployed?

Dr. BRZEZINSKI. Do you mean the Titan?

Senator EXON. Yes.

Dr. BRZEZINSKI. Well, the number is so small, the system is so old.

Senator EXON. What number? Nine megatons is not small.

Dr. BRZEZINSKI. No; but the total number is what?

Senator EXON. Well, if I remember, we had 52, and I think it is not a classified number—I think it is open.

Dr. BRZEZINSKI. Is it 18?

Senator EXON. We are down to 20-some today, in that neighborhood.

Dr. BRZEZINSKI. I have the figure 18 in my mind, but I may be wrong.

Senator EXON. We had 52 at one time, and one of them blew up, and that left 51.

Dr. BRZEZINSKI. I have the figures. On January 1, 1984, it was 38.

Senator EXON. And we are considerably below that now.

Dr. BRZEZINSKI. It must be less now. For January 1, 1984—I have the figure 18 in my mind, though I don't know why.

I don't feel strongly about it, largely because it is essentially a second strike system, and it takes a long time to get it going, and so forth. If it is a second strike system, it would get wiped out by the Soviets if there were a nuclear war in a first strike.

Senator EXON. The same thing is true of the MX, is it not?

Dr. BRZEZINSKI. Let me correct myself. I meant to say that it is primarily a first strike system. It takes so long to gear it up and to get it going that, unless we are using it in a first strike, we could not use it; whereas the MX and the Minuteman are essentially still usable, even under attack. You can get them off fast—it is liquid fuel and takes time to get geared up and going.

Senator EXON. Let me ask you one SDI question and then we can go into this further in the second round.

I read in the paper this morning, Dr. Brown, that while testifying yesterday said that in his opinion, we could relatively soon deploy an ABM defense system around our missile fields.

Dr. BRZEZINSKI. Right.

ABM DEFENSE SYSTEM

Senator EXON. He did not spell out how we could do that. All the information that we have, at least as far as the strategic defense initiative is concerned—says that we might figure out what we could do by the early 1990's, and sometime after that deploy it.

I am wondering if you agree with Dr. Brown's statement, and if you do, would you spell out what systems you think we might proceed with next year or the year after that to protect our missile fields?

Dr. BRZEZINSKI. I completely agree with Dr. Brown, and I have already spoken to that. We are now in a situation in which we know we can deploy an ABM system around our missile sites based on existing technology involving nonnuclear warheads; and we know that such a system would be, up to a certain point, effective, though it would be susceptible to being swamped by a massive barrage attack. To avoid such swamping, therefore, it ought to be reinforced by a second shield, which would be the boost phase shield in space involving, again, nonnuclear, heat-seeking projectiles, like the Maverick, designed to intercept Soviet missiles before the warhead separates and the individually targeted warheads begin to enter their trajectory.

It is important to do it at that early phase because at that early phase the hits would be essentially random and, therefore, no Soviet planner would be able to know what percentage of his forces would actually get to the targets that have to be swamped. Such a combination of the two would, in fact, negate the military utility of a first strike.

So I think Dr. Brown is absolutely right. I don't think there is any dispute. And I do not think, therefore, that it is a question of faith. We do know what we can do. We also do know what we do not know. We do know that of the four phases of strategic defense—the boost, the post-boost, the midcourse, the terminal—we can build a terminal now, the probabilities are very high that we can build the boost, and we need to do a lot of research——

Senator EXON. How soon, Doctor?

Dr. BRZEZINSKI. By the 1990's. Probably between the beginning of the 1990's and the first half of the 1990's, depending on how certain things would work out with regard to the boost phase which still would require some experimentation and some maturation of

existing technologies. But I am talking about existing technologies, and not new technologies that would be needed. We are not talking here about the esoteric space guns, particle beam weapons, or lasers. We are not talking about any of that. We are talking about heat seeking missiles, which already exist.

Senator EXON. Thank you. My time is up.

Senator WARNER. Thank you.

Senator Wilson?

Senator WILSON. Thank you, Mr. Chairman.

Dr. Brzezinski, much has been made, as your comments reflect already, of Ambassador Nitze's recent comments on SDI. He has asserted that any defensive deployment must be survivable and must be cost effective.

Let me ask you to further elucidate your comments. You have already addressed Ambassador Nitze's recent remarks.

When we speak of cost effectiveness, it seems to me that we are talking about two different kinds of cost effectiveness. One is a dollar cost. The second, the more important, it seems to me has to do with the cost in confidence to a Soviet war planner entertaining the concept of a first strike. Although you have said that the purely terminal defense is arguably susceptible of being swamped, that even in that first stage, even before we had the boost phase capability that you are talking about, would not the confidence of a Soviet war planner be so shaken by the possibility that, even given the time involved to avoid fratricide, we would be able to launch some of the missiles and protect some of the missiles, that it makes measurably more uncertain the success of a first strike?

FIRST STRIKE CAPABILITY

Dr. BRZEZINSKI. Well, it certainly makes it somewhat less certain. But my studies of the subject, which are far from perfect, and there are many people who know more about it than I, have led me to the view that, by itself, the terminal defense system, an ABM system, could be swamped by highly concentrated, successive series of attacks, close enough, but not close enough, to precipitate fratricide; and, therefore, it does not give you the kind of survivability rates that you would wish to have in order to negate the calculability of what might be called a first strike.

After all, a first strike, to be effective, has to attrit your forces to a significant degree but not totally destroy them.

Now where you draw that line is debatable. But, nonetheless, if there were a major breakout in Soviet offensive forces, a large number of warheads with increased precision, I think a terminal defense system could be overwhelmed.

Now, maybe that would be enough to complicate the planner, I agree with you. But with a boost phase interception, which has a random effect—you don't know then what is shot down and what is not—you would greatly, greatly increase these complications and make it really impossible to plan.

This is why it is desirable.

Also, there is a problem that, with terminal defense, you ought to really, at the present stage, intercept in the atmosphere, because only in the atmosphere does the drag effect begin to separate

decoys and chaff from the real warheads. That also makes it somewhat late. So it is better to have the two.

Sure, by itself it would complicate it. But I am not sure whether it would really give you the confidence that you would want, especially if there is a breakout in the number of warheads.

TWO-TIERED DEFENSE

Senator WILSON. Both in your testimony today and also in the New York Times Magazine article you have said that we can have a defensive technology deployed by the 1990's. As I understood you today, you said a two-tiered defense.

Dr. BRZEZINSKI. Yes.

Senator WILSON. So, what you are saying when you indicate to Senator Exon that we could do that within the period of the first half of the decade of the 1990's is that we can have not only the terminal but also the boost phase?.

Dr. BRZEZINSKI. That's right—but, in a counter first strike mode, not the President's comprehensive population defense system, which requires the other two phases.

Senator WILSON. Well, then, it would seem that those who are concerned about the militarization of space have missed a rather basic point, and that is that these weapons, whether we are talking about terminal defense or the boost phase weapons, would only attack weapons in space; they would cause no loss of life on the ground.

Dr. BRZEZINSKI. That's right.

They would be nonnuclear.

Senator WILSON. Yes; that is right, in addition to being nonnuclear.

Then let me ask you this. It has been rather remarkable, I think, that the Soviets have been as explicit as they have in approaching these talks that their goal was to deprive the United States of the strategic defense initiative. Would you think that we would be wise to trade away the effort that we are making on SDI for some reduction in offensive weaponry? What offensive reduction would make that worthwhile?

Dr. BRZEZINSKI. You are asking one of those questions which, if you answer it honestly, has the effect of damaging the intent of your answer. In other words, if I want to make a deal with the Soviets in which they reduce their offensive systems to such a significant degree that we really have security and they have security—something which they have been unwilling to do—I can only, I think, do that if I first convince them that I am going to build the thing.

I am not going to convince them that I am going to build the thing if I tell you right now that I am going to trade it at the first opportunity for a deal.

That is the dilemma that we face.

Now we are a democracy and we have to talk about these things relatively openly. But we do have to consider the consequences of our words. Therefore, in any case, having already indicated to you, in a way, my answer, I would go ahead with the needed funding

and take the necessary steps toward at least initial deployment—all of which, of course, is reversible.

Senator WILSON. I take it, pursuant to that strategy, that you would set a very high price on SDI?

Dr. BRZEZINSKI. I would think that the most important thing to bear in mind is not numerical ratios or quantitative equivalence, but the fashioning of a general stability, which means removal of those systems which are most threatening to us and of ours to them.

We are very clear as to which of theirs are most threatening to us, and they know it. They have been refusing to bargain on it.

They really have.

After all, we started with an administration in which the predominant climate was not one associated, generally speaking, let us say, with my public image, to put it euphemistically.

The Soviets had a real chance for a bargain with that administration. We said to them look, do something about these systems which really threaten us. They refused. They categorically refused.

So we now have to do something which has greater persuasive power than that, and I think we do have that. Therefore, we ought to act in a mature and responsible way, deploy the offensive systems that we now have coming downstream and go ahead and move in this direction because either they will change their mind—which would have an accommodation, or they will not change their mind, in which case we deploy and we will have the same effect as if they had changed their mind.

Senator WILSON. As you are well aware, having addressed these arguments in the New York Times Magazine article, there have been a number of arguments—often conflicting—leveled against the SDI. We have been told, one, that it is unattainable, that it won't work; second, that it is destabilizing because it is dangerous and would provoke the Soviets.

The concern I think that many have is that it is going to undermine arms control negotiations. From what you said today, you clearly do not share that view and, in fact, think that it provides a considerable incentive to the Soviets to engage in serious arms control negotiations.

Dr. BRZEZINSKI. Absolutely. I find it sometimes almost amusing to listen to the arguments against the SDI because people give you a litany, such as it is unattainable; two, it will cost too much; three, it is destabilizing; four, it bothers the Soviets; and the Soviets will do the same.

There is an obvious pattern of logical inconsistency between all these arguments.

If it is unattainable and costs too much, why should it be offensive to the Soviets? They are not generally in the business of trying to make us as healthy as we can be. And why should they go ahead and build it themselves?

It is a whole series of inconsistent arguments that are made.

I think the serious arguments are: is it feasible or not? Some aspects we know are, and some we don't yet know. Also, if it is feasible, how do we apply it in such a way as not to make the situation worse?

Let me reiterate a very important point. If we go ahead with the SDI and at the same time maximize the deployment of time-urgent, first strike capable, highly precise offensive systems, then we do contribute to instability. But we don't have to do that.

Senator WILSON. I take it, then, that you are not impressed with another argument that is made, which is that it is pointless to engage in SDI, even if it were absolutely effective against ballistic missiles because it still provides no defense against cruise missiles? The response which I think you have made is because of the character of ballistic missiles, because they are the most destabilizing, because they are the preemptive first strike weapon, 75 percent of the inventory of the Soviet arsenal, that SDI, to the extent it can neutralize that and make it uncertain and remove the threat of the first strike, is definitely worth doing.

Dr. BRZEZINSKI. Yes; let me put it numerically. A population-wide SDI, even if 90 percent effective, is, in effect, ineffective. But, a counter first strike SDI, even if only 30 percent effective, is effective.

Senator WILSON. Let me ask you this final question.

Your own experience in the Carter administration I think has given a clue as to this. You expressed hope today that the Soviets might change.

Do you think that we can get the Soviets to agree to a treaty, to some agreement limiting warheads and throw-weight without the MX in our arsenal?

Dr. BRZEZINSKI. Well, I am not quite sure I understand your question.

Are you saying can we get them to agree to some reduction in throw-weight and warheads in return for the MX? Is that what you are saying?

Senator WILSON. I am saying if Congress were to vote to unilaterally do away with the MX——

Dr. BRZEZINSKI. Oh, if we do not have it.

Senator WILSON [continuing]. We do not have it in our arsenal, then do we offer sufficient incentive or would we simply be stuck with the present SALT II limits on launchers?

Dr. BRZEZINSKI. Well, if we killed the MX in Congress, then we will have to have something else to negotiate with with the Soviets regarding the megatonnage. We will have to give something else away.

So it certainly will help the Soviet negotiating position. It would kill it at this stage.

Senator WILSON. And the hope for a limit on warheads and throw-weight I gather you think is not much of a hope without some substance to bargain with?

REDUCTIONS OF MEGATONNAGE

Dr. BRZEZINSKI. Well, as I said earlier, I would like to experiment with this interim limited agreement formula—1,800 launchers and 7,500 warheads—because actually it does have an indirect effect on megatonnage. Even if you have maximum freedom to mix for both sides for the forces under that formula—you choose what you dismantle and you choose what you keep—the net effect, nonetheless,

would be some significant reductions of megatonnage. That is why I favor my formula, because I think it is an indirect way of getting at the megatonnage issue without having to negotiate it directly.

Senator WILSON. But, can you get it?

Senator WARNER. I will have to interrupt. We are a little over your time limit and I am watching the clock carefully. The witness has asked to leave and the Chair is going to have to forego his questions.

We will now have Senator Levin.

Senator WILSON. I'm sorry.

Senator WARNER. That's all right.

Senator LEVIN. Dr. Brzezinski, welcome.

Harold Brown has written the following:

> An imperfect offense could not be expected to reduce significantly the damage to the United States if deterrence failed through a deliberate major attack to protect the United States against any of the cases of small missile attacks. The United States would need to deploy a substantial and extensive ABM system, and the risks of deploying such a system outweigh its potential for savings in American lives. I therefore continue to oppose moving to abrogate or modify the ABM Treaty, despite the new technical developments and hope that there may be further ones.

That is just one of the things he says which certainly differs, it seems to me, from what you have said here today.

The rest of his paper and I think his testimony differ significantly from what you have told us today.

I am just wondering if we have made or will be making an attempt to hear from Harold Brown or other people who have some questions about the SDI?

Senator WARNER. The Chair assures the member that we are making that effort.

Senator LEVIN. All right.

Will we hear from some opponents of SDI as well?

Senator WARNER. We have offered that opportunity and that is being worked on also. A full opportunity will be given.

Senator LEVIN. I thank the Chair for that.

Dr. Brzezinski, you mentioned that the treaty, the ABM Treaty itself, as you phrased it, has a provision which provides that it lapses unless there is an agreement limiting offensive systems.

Which article of the treaty is that?

Dr. BRZEZINSKI. There is language in the treaty—I don't remember the article—which talks about the treaty having to be followed by an agreement limiting offensive systems, and so forth.

Senator LEVIN. And that language is right in the treaty?

Dr. BRZEZINSKI. Yes.

Senator LEVIN. How confident are you of that?

Dr. BRZEZINSKI. Well, quite frankly, I received a letter from the author of the treaty stating that to me. I have not gone back to check up on it, but I assume that he knows what he is talking about.

Senator LEVIN. Well, Mr. Chairman, I can't find that language in the treaty.

I would like to ask the staff just to check and find that language. Maybe it is there, and I can't find it. I have overlooked language, too, in my lifetime.

Senator WARNER. If the Senator would yield just for a moment, I am advised that that language is found in the unilateral statement made by Gerard Smith.

Senator LEVIN. Indeed, it is.

That is very different from a provision in the treaty.

Dr. BRZEZINSKI. A unilateral statement by the United States?

Senator LEVIN. That's right.

Dr. BRZEZINSKI. All right. So our position on it is clear and part of the record.

Senator LEVIN. Well, you said there was a provision in the treaty which says it lapses. That is very different from a unilateral statement.

Dr. BRZEZINSKI. Well, I stand corrected. But the point is, that is the understanding under which the United States entered the treaty. It is part of the record and was so communicated to the Soviets. It was a statement of our intention.

We cannot be taken very seriously if we make statements of such gravity, and then they are dismissed years later on the grounds that, well, they were not part of the treaty.

Senator LEVIN. I am not saying anything other than your repeated statement today here that there was a provision in the treaty which says that it lapses in the absence of an agreement reducing offensive weapons, is not accurate. That is all I am saying.

Dr. BRZEZINSKI. Well, all I am telling you is that I was referring to a source that was given to me. The point still stands, however, namely, that our entrance into the treaty was conditional on that understanding, namely that there would be limitations in offensive systems. That is why we have entered the treaty.

Senator LEVIN. Well, I think it is important that the language of that unilateral declaration be made part of the record at this point. And even that is something different from how you have just characterized.

I would like the May, 1972 statement of Ambassador Smith, which is "Unilateral Statement III-A" to be made part of the record at this time because even that is significantly different from the characterization that was made.

Senator WARNER. Apparently, that statement was incorporated in the representations made to the Senate for purposes of ratification.

Dr. BRZEZINSKI. So, it was part of the ratification process as well and, therefore, involves the congressional branch as well.

Senator LEVIN. I would like the language, if the Chair would agree, of III-A to be made a part of the record at this time. I think it is important.

Senator WARNER. The Senator has raised a very important point, and it will be done.

[The information follows:]

[United States Arms Control and Disarmament Agency]

Agreed Statements, Common Understandings, and Unilateral Statements Regarding the Interim Agreement Between the United States of America and the Union of Soviet Socialist Republics on Certain Measures With Respect to the Limitation of Strategic Offensive Arms

3. UNILATERAL STATEMENTS

(a) The following noteworthy unilateral statements were made during the negotiations by the United States Delegation:

A. WITHDRAWAL FROM THE ABM TREATY

On May 9, 1972, Ambassador Smith made the following statement:

The U.S. Delegation has stressed the importance the U.S. Government attaches to achieving agreement on more complete limitations on strategic offensive arms, following agreement on an ABM Treaty and on an Interim Agreement on certain measures with respect to the limitation of strategic offensive arms. The U.S. Delegation believes that an objective of the follow-on negotiations should be to constrain and reduce on a long-term basis threats to the survivability of our respective strategic retaliatory forces. The USSR Delegation has also indicated that the objectives of SALT would remain unfulfilled without the achievement of an agreement providing for more complete limitations on strategic offensive arms. Both sides recognize that the initial agreements would be steps toward the achievement of more complete limitations on strategic arms. If an agreement providing for more complete strategic offensive arms limitations were not achieved within five years, U.S. supreme interests could be jeopardized. Should that occur, it would constitute a basis for withdrawal from the ABM treaty. The U.S. does not wish to see such a situation occur, nor do we believe that the USSR does. It is because we wish to prevent such a situation that we emphasize the importance the U.S. Government attaches to achievement of more complete limitations on strategic offensive arms. The U.S. Executive will inform the Congress, in connection with Congressional consideration of the ABM Treaty and the Interim Agreement, of this statement of the U.S. position.

Senator LEVIN. This treaty does not "lapse." That is a word which you used today, and I think it is a critical word. This treaty does not lapse. This treaty can be abrogated by either side if, under certain circumstances, it finds that its supreme interests would be or could be jeopardized. That is the language in the treaty.

Dr. BRZEZINSKI. If a treaty can be abrogated, then, obviously, it lapses. I think we are quibbling over words.

The point is the United States entered that treaty with a clearly stated understanding and with a clearly stated intention, namely that it reserves the right to abrogate it, and, therefore, the treaty lapses if there is no follow-on agreement limiting offensive systems.

Senator LEVIN. That characterization is getting closer to what the unilateral statement said.

Dr. BRZEZINSKI. That is a very important consideration.

Senator LEVIN. It is very important, indeed, and it is very different from your testimony.

Now I will let it stand at that. I will let it stand there. I am going to characterize it that way. A unilateral declaration saying we might do something if our supreme interest is in jeopardy is very different than saying a treaty on its own terms—as you phrased it—clearly says that it lapses.

I am going to say that for the record.

Dr. BRZEZINSKI. Now you are inserting words into what I said, because I did not say "on its own terms."

Senator LEVIN. You said it lapses.

Dr. BRZEZINSKI. But I did not say "on its own terms." I did say the treaty lapses, and if we abrogate it, it obviously lapses.

Senator LEVIN. No; that is not at all obvious legally. But I do not want to quibble with you either.

I will make a statement that it is very different to say that we can abrogate a treaty and declare that it is over if our supreme interests are jeopardized if we might, to say as you did, that the treaty clearly says—you said that the treaty clearly says that it lapses under a certain condition. I am just saying that that is very, very different. That is all I am saying.

Dr. BRZEZINSKI. I am reiterating the point that the United States entered that treaty with a clear statement that, if there is no follow-on agreement limiting offensive systems, it has the right to abrogate it and, therefore, the treaty lapses.

Senator LEVIN. Your testimony before, compared to what you just said, can be seen. I will let the record stand for itself rather than argue the point further.

COUNTERMEASURES

Mr. Chairman, Senator Quayle asked Dr. Brzezinski a critical question, and I think his answer was helpful, and that is if we deploy a system, isn't this going to lead the Soviet Union to deploy a similar system. Dr. Brzezinski's answer I think was "hopefully, yes," or words to that effect.

I don't want to mischaracterize it, but I think that is what the question and answer was, and I have to agree that that probably is the likely response.

Should it be our position, then, Doctor, that we would not seek countermeasures to the Soviet deployment if we would hope they would deploy SDI and would want them to, so that they would feel some kind of security, the same kind of security which SDI might give us in your view? Would we then, in your view, not want to seek countermeasures to a Soviet SDI?

Dr. BRZEZINSKI. Not necessarily, because if the Soviet SDI remains essentially limited to a counter first strike capability, then we have no particular reason to try to override it, because in none of our war plans do we make provision for a massive, first strike attack on the Soviets. So, a limited counter first strike Soviet SDI would not be troublesome.

If the Soviets began to deploy, assuming it is feasible, a large scale, populationwide SDI, then, obviously, it would be of concern to us and we would have to find ways of overriding it.

Senator LEVIN. How would we know, as they were beginning their deployments, how extensive they would be? If they started out deploying it just to protect their missiles and their command authority, would we then wait to see whether they deployed around their cities before we would begin counter measures, in your view?

Dr. BRZEZINSKI. That is very hard for me to answer because one would have to make a clear assessment of the lead times involved, the point at which such a system could become effective, the amount of time it takes to develop counter systems. But, in gener-

al, it seems to me that, if they are to seek a population-wide defensive system, it is not merely a matter of deploying ABM's around their cities. It is also a matter of developing and deploying systems in space in those two phases of flight regarding which there is still a great deal of uncertainty as to what the feasibility of a comprehensive SDI actually is.

Senator LEVIN. Should we be spending money now on counter measures for a Soviet SDI?

Dr. BRZEZINSKI. I think at this stage we are justified, in my judgment, in developing an SDI capability which focuses on the first and the fourth phases of the missile flight and closely monitoring whether the Soviets at this stage are doing more than that or essentially concentrating on a more limited counter first strike capability. I think in this context some research which might give us a greater degree of control over flight patterns in the event of an attack is probably warranted, so that we are not caught in a situation in which we have too great a lead time to overcome in the face of actual Soviet programs.

Senator LEVIN. You have identified a $15 billion phase I and a $45 billion phase II, I believe, amount to your limited counter first strike definition of SDI.

How effective would those two systems be? Can you give us a percentage effectiveness?

Dr. BRZEZINSKI. Well, I can only give you a percentage effectiveness that has been expressed by military and technical experts working in that area, and that is a range of effectiveness somewhere in the environment of 70 percent.

Now, two shields 70 percent effective each produce a situation in which 91 percent of the incoming forces are attrited. That is a very high percentage for a precise surgical first strike.

I personally would venture the judgment that if each shield were only 30 percent effective—in other words, 70 percent ineffective—it would still be militarily an effective counter to first strike.

So, the projected effectiveness is, in fact, more than adequate to attrit and disrupt effectively a first strike.

Senator LEVIN. I thank you.

ALLIES BENEFIT FROM SDI

Senator WARNER. Doctor, I will just ask one question in order to stay within the timeframe that you have generously provided the subcommittee.

I have a concern that this administration has not been able thus far fully to assuage the concerns of our allies. Yet the early technical data indicate, at least to this Senator, that there are some potential benefits to the allies from this sytem.

Would you care to comment on that?

Dr. BRZEZINSKI. First of all, let me say that there are indications that our allies are beginning to change their attitude. I was going to say their minds, but I don't think they have changed their minds, yet. But their attitudes are changing.

They started off being very critical and fearful, perhaps even taken aback by the suddenness of the initiative. Then they started being fearful that this might result in the United States producing

what they have referred to as a strategic condominium with the Soviets.

I think they are now changing their minds and changing their attitudes for two reasons. First, they want to be in on the research, because they know that the research can be catalytically very important. It can be a new spurt of dynamism for high tech and science in this country and they want to be part of it. Second, they are beginning to calculate that if the U.S. nuclear determination to react to protect them is enhanced because our vulnerability is decreased, they actually are the military beneficiaries of such a deployment.

Do not forget that it has only been several years since a number of people, including Mr. Kissinger, said that the American nuclear deterrent is now no longer so secure; Europe is less protected because America is now vulnerable; and many Americans will ask: Should we die for Europe?

But, in fact, if our nuclear forces are becoming more invulnerable and can be protected effectively, American nuclear determination is bound to be somewhat higher. This is to the benefit of Europe.

Senator WARNER. Doctor, we thank you very much for your testimony this afternoon. It has been a very helpful addition to the record. It will be made available, of course, to the Senate on the whole.

[From the New York Times Magazine, Jan. 27, 1985]

DEFENSE IN SPACE IS NOT STAR WARS

(By Zbigniew Brzezinski, Robert Jastrow, and Max M. Kampelman)

Faith moves mountains. When it is in eternal religious values, faith is an indispensable strength of the human spirit. When it is directed toward political choices, it is often an excuse for an analytic paralysis.

Regrettably, our national debate over President Reagan's suggestion that the country develop a strategic defense against a Soviet nuclear attack is taking on a theological dimension that has no place in a realistic search for a path out of the world's dilemma. The idea of basing our security on the ability to defend ourselves deserves serious consideration. Certainly, the role of strategic defense was a major issue in the recent dialogue in Geneva between United States Secretary of State George P. Shultz and Soviet Foreign Minister Andrei A. Gromyko on new arms-control negotiations.

For many years, our search for security has been restricted to designing offensive weapons to deter aggression through fear of reprisals. We must not abandon nuclear deterrence until we are convinced that a better means is at hand. But we cannot deny that, for both the Soviet Union and the United States, the costs, insecurities and tensions surrounding this search for newer, more effective and more accurate nuclear missiles produce a profound unease that in itself undermines stability.

The conventional view is that stability in the nuclear age is based on two contradictory pursuits: the acquisition of increasingly efficient nuclear weapons and the negotiation of limits and reductions in such weapons. The United States is diligently pursuing both objectives, but the complexity of arriving at effectual arms-control agreements is becoming apparent as more precise and mobile weapons, with multiple warheads, appear on both sides. Unlike ours, moreover, many Soviet missile silos are reloadable, and thus the number of silos does not indicate the number of missiles, further complicating verification.

We must never ignore the reality that the overwhelming majority of the Soviet strategic forces is composed of primarily first-strike weaponry. And given the large numbers of first-strike Soviet SS–17, -18 and -19 land-based missiles, no responsible American leader can make decisions about security needs without acknowledging that a Soviet first strike can become a practical option.

The Russians could strike us first by firing the reloadable portion of their nuclear arsenal at our missiles, the Strategic Air Command and nuclear submarine bases, and if the surviving American forces (essentially nuclear submarines) were to respond, the Russians could immediately counter by attacking our cities with missiles from nonreloadable silos and, a few hours later, with whatever of their first-strike reloadable weapons had survived our counterattack. They are set up for launching three salvos to our one.

To us, this catastrophic exchange is unthinkable. But, with the strong probability that the American response would be badly crippled at the outset by a Soviet strike, some Russian leader could someday well consider such a potential cost bearable in the light of the resulting "victory". Furthermore, such an analysis might well anticipate that an American President, knowing that a strike against our cities would inevitably follow our response to a Soviet first strike, might choose to avoid such a catastrophe by making important political concessions. No responsible American President can permit this country to have to live under such a threat, not to speak of the hypothetical danger of having to choose either annihilation or submission to nuclear blackmail. Hence the understandable and continual drive for more effective offensive missiles to provide greater deterrence.

The result is that weapons technology is shaping an increasingly precarious American-Soviet strategic relationship. For this reason, we urge serious consideration be given to whether some form of Strategic Defense Initiative (S.D.I.) might not be stabilizing, enhancing to deterrence and even helpful to arms control. To that end, we address the major issues in strategic defense from three points of view:

(1) The technical: Is a defense against missiles technically and budgetarily feasible?

(2) The strategic: Is a defense against missiles strategically desirable? Does it enhance or diminish stability? Does it enhance or diminish the prospects for arms control and a nuclear-weapons build-down?

(3) The political: What are the political implications of strategic defense for our own country and for our relations with our allies? What are the implications for the larger dimensions of our relationship with the Soviet Union? How do we seek the needed domestic consensus on a viable strategy?

A great deal has been written about the state of missile-defense technology. Some experts say the technology sought is unattainable, others that it is merely unattainable in this generation. Yet the promise of the Strategic Defense Initiative is real. Some of the technologies are mature and unexotic. Their deployment around the end of this decade would involve mainly engineering development. Technically, these vital defenses could be in place at this moment were it not for the constraints accepted by the United States in its adherence to the antiballistic missile treaty of 1972.

With development and some additional research, we can now construct and deploy a two-layer or double-screen defense, which can be in place by the early 1990's at a cost we estimate to be somewhere in the neighborhood of $60 billion. A conservative estimate of the effectiveness of each layer would be 70 percent. The combined effectiveness of the two layers would be over 90 percent: Less than one Soviet warhead in 10 would reach its target—more than sufficient to discourage Soviet leaders from any thought of achieving a successful first strike.

The first layer in the two-layer defense system—the "boost-phase" defense—would go into effect as a Soviet first-strike missile, or "booster", carrying multiple warheads rises above the atmosphere at the beginning of its trajectory. This boost-phase defense—based on interception and destruction by nonnuclear projectiles—would depend on satellites for the surveillance of the Soviet missile field and the tracking of missiles as they rise from their silos. These operations could only be carried out from space platforms orbiting over the Soviet Union. Because they are weightless in orbit, such platforms could be protected against attack by heavy armor, onboard weapons and maneuverability.

After the booster has burned out and fallen away, the warheads arc through space on their way to the United States. The second layer of the defense—the terminal defense—comes into play as the warheads descend. Interception would be at considerable altitude, above the atmosphere if possible. This second phase requires further engineering, already under way, because interception above the atmosphere makes it difficult to discriminate between real warheads and decoys. In the interim, interception can take place in the atmosphere, where differences in air drag separate warheads from decoys. In either event, destruction of the warheads would take place at sufficiently high altitude, above 100,000 feet, so that there would be no ground damage from warheads designed to explode when approached by an intercepting missile.

Of the two layers in the defense, the boost phase is by far the most important. It would prevent the Russians from concentrating their warheads on such high-priority targets as the national-command authority (the chain of command, beginning with the President, for ordering a nuclear strike), key intercontinental-ballistic missile silos or the Trident submarine pens, because they could not predict which booster and which warheads would escape destruction and get through.

This fact is important. Simply a so-called "point defense" of our missile silos, it has been suggested, would be sufficent to restore much of the credibility of our land-based deterrent, now compromised by 6,000 Soviet ICBM warheads. It is particularly necessary to protect the 550 silos containing our Minuteman III ICBM's, of which 300 have the highly precise Mark 12A warheads. These are the only missiles in the possession of the United States with the combination of yield and accuracy required to destroy hardened Soviet military sites and the 1,500 hardened bunkers that would shelter the Soviet leadership. But their very importance to us illustrates the difficulty of a point defense, because the value of the silos to us means they will be among the highest-priority targets in any Soviet first strike. The Russians can overwhelm any point defense we place around those silos, if they wish to do so, by allocating large numbers of warheads to these critical targets. But if we include a boost-phase defense to destroy their warheads at the time of firing, their objective becomes enormously more difficult to accomplish.

The boost-phase defense has still another advantage. It could effectively contend with the menace of the Soviet SS–18's, monster missiles twice the size of the 97.5-ton MX. Each SS–18 carries 10 warheads, but probably could be loaded with up to 30. The Russians could thus add thousands of ICMB warheads to their arsenal at relatively modest cost. With numbers like that, the costs favor the Russians. But a boost-phase defense can eliminate all a missile's warheads at one tim—an effective response to the SS–18 problem.

The likely technology for an early use of the boost-phase defense would use "smart" nonnuclear projectiles that home in on the target, using radar or heat waves, and destroy it on impact. The technology is close at hand and need not wait for the availability of the more devastating but less mature technologies of the laser, the neutral particle beam or the electromagnetic rail gun. The interceptor rocket for this early boost-phase defense could be derived from air-defense interceptors that will soon be available, or the technology of antisatellite missiles (ASAT) launched from F–15 aircraft. These rockets could weigh about 500 pounds, the nonnuclear supersonic projectiles about 10 pounds.

Interceptor rockets would be stored in pods on satellites and fired from space. The tracking information needed to aim the rockets would also be acquired from satellites orbiting over the Soviet missile fields. The so-called "space weapons" of strategic defense are indispensable for the crucial boost-phase defense. To eliminate them would destroy the usefulness of the defense.

We estimate that the cost of establishing such a boost-phase defense by the early 1990's would be roughly $45 billion. That price tag includes 100 satellites, each holding 150 interceptors—sufficient to counter a mass Soviet attack from all their 1,400 silos; plus four geosynchronous satellites and 10 low-altitude satellites dedicated to surveillance and tracking; plus the cost of facilities for ground-control communications and battle management.

The technology used for the terminal defense could be a small, nonnuclear homing interceptor with a heat-seeking sensor, which would be launched by a rocket weighing one to two tons and costing a few million dollars each. Interception would take place above the atmosphere, if possible, to give wider "area" protection to the terrain below. These heat-seeking interceptors can be available for deployment in about five years if a decision is reached to follow that course. One concept for this technology was tested successfully last June by the Defense Department, when an intercepting missile zeroed in on an oncoming warhead at an altitude of 100 miles and destroyed it.

The technology for a terminal defense within the atmosphere would be somewhat different, but would probably also depend on heat-seeking missiles. The cost of this terminal layer of defense would be about $15 billion and include $10 billion for 5,000 interceptors, plus $5 billion for 10 aircraft carrying instruments for tracking of the Soviet warheads.

The estimated $60 billion for this two-layer defense is a ball-park figure, of course. However, even with its uncertainties, it is surely an affordable outlay for protecting our country from a nuclear first strike.

To be sure, the above is not an attractive option to those who place all their eggs in the arms-control basket and underestimate the immense difficulty of attaining an effective and truly verifiable pact. It is also not appealing to those wedded to the

idea that it is best to assure survival by simply maintaining the perilous balance of terror between the United States and the Soviet Union. We favor energetically pursuing arms-control negotiations and seeking to achieve credible deterrence, but these options by themselves are unfortunately not as likely to provide a more secure future as the alternative strategy of mutual security combining defense against missiles with retaliatory offense.

The simplest and most appealing option, quite naturally, is comprehensive arms control. Large reductions in both launchers and warheads, as well as effective restrictions on surreptitious deployment or qualitative improvements, would enhance nuclear stability and produce greater mutual confidence. It would, if properly negotiated and effectively monitored, enhance mutual survival.

How likely is such a future? Some progress in arms control is probably possible, but genuinely effective arms control would require that: (1) there be a restraint imposed on qualitative weapons enhancement; (2) mobile systems, relatively easy to deploy secretly, be subject to some form of direct verification; (3) a method be devised for distinguishing nuclear-armed and nonnuclear cruise missiles, and (4) monitoring arrangements be devised for preventing surreptitious development, testing and deployment of new systems. So far, the Soviet record of compliance with the SALT I and SALT II accords is sufficiently troubling to warrant skepticism regarding the likelihood of implementing any such complex and far-raching agreement.

Moreover, such an agreement would have to recognize that it is no longer possible to limit space-based systems without imposing a simultaneous limit, along the above lines, on terrestrially deployed systems, which present the greater threat to survival. After all, the space-based defenses include no weapons of mass destruction and no nuclear weapons. And it should be some cause for concern to note the Soviet insistence on prohibiting space-based defensive systems, the only method now available to inhibit the first-strike use of land-based Soviet offensive systems.

Finally, a comprehensive and genuinely verifiable agreement, limiting both qualitatively and quantitively the respective strategic forces, on earth and in space, will require a much more felicitous political climate than currently exists. Negotiations may lead to such improvement, but in the setting of intense and profound geopolitical rivalry, how realistic is it to expect in the near future accommodation sufficient to generate the political will essential for a genuine breakthrough in arms-control negotiations? The mere mentions of Afghanistan, Nicaragua, Sakharov and Soviet violations of the humanitarian provisions of the Helsinki Final Act dramatize the depths of the problem. There may be no direct negotiating linkage between these acts of Soviet misconduct and arms control, but their political interaction is evident.

This is why there is currently such an emphasis on maintaining peace via the doctrine of deterrence based on mutual assured destruction, called MAD. But what does this mean in an age when weapons are becoming incredibly precise, mobile and difficult to count? In the absence of a miraculous breakthrough in arms control, the only possible protection within the framework of the deterrence approach is to stockpile more offensive systems. This is in part what we are doing. But how many of such systems will be needed in the likely conditions of the next decade? If Soviet strategic forces continue to grow both quantitatively and qualitatively, our country will have to deploy, at enormous cost, probably no fewer than 1,500 to 2,000 mobile Midgetmen to preserve deterrence. How will they be deployed? Where? And at what cost? And will the Soviet Union and the United States be more or less secure with the deployment of such precise weaponry capable of effective preemption? The Soviet answer is clear: The Russians are busy enhancing the survivability of their leadership and of their key facilities by hardening, dispersal and deception.

This second traditional alternative, mutual assured destruction, cannot be an acceptable, long-run option, although it is a necessary policy in the absence of an alternative, given the dynamics of weapons technology. Thus, a new third option, the Strategy of Mutual Security, must be explored as preferable. The combination of defense against space missiles with retaliatory offense in reserve enhances deterrence.

And it does not compromise stability, even if only the United States were initially to have such a strategic defense. The deployment of the systems described above would not give us absolute protection from Soviet retaliation against a possible first strike by us, a reasonable though misplaced Soviet concern. Furthermore, the Russians know we are not deploying first-strike counterforce systems in sufficient numbers to make a first strike by us feasible. In any case, one can be quite certain that the Russians will also be moving to acquire an enhanced strategic defense, even if they do not accept President Reagan's offer to share ours. Indeed, they are doing so now and have been for some time.

As our strategic space-defense initiative expands incrementally, it should be realistically possible to scale down our offensive forces. Such a transition, first of the

United States and eventually of the Soviet Union, into a genuinely defensive posture, with neither side posing a first-strike threat to the other, would not only be stabilizing but it would also be most helpful to the pursuit of more far-reaching arms-control agreements. Strategic defense would compensate for the inevitable difficulties of verification and for the absence of genuine trust by permitting some risk-taking in such agreements. This is another reason why strategic defense should not be traded in the forthcoming negotiations in return for promises that can be broken at any time.

No significant public policy can be carried out in a democracy without being fully discussed and accepted by the broad polity. Nor can an interested public be expected to resolve disputes among experts as to questions of technical feasibilty. The current debate over President Reagan's initiative for a strategic defense program suffers from that conflict among scientists. It is important to clarify this issue.

We can begin a two-tiered strategic defense that would protect command structure as well as our missiles and silos and thus discourage any thoughts by the Soviet military that a first-strike effort would be effective. Some within the scientific community minimize the importance of this technical feasibility and emphasize instead the view that it is scientifically impossible today to provide a strategic defense that will protect our cities. Such a broad defense of populations is today not feasible, but it is prudent for our society to keep in mind the rising tide of technical and scientific advances so rapidly overwhelming the 20th century.

The "impossible" is a concept we should use with great hesitation. It is foolhardy to predict the timing of innovations. We are persuaded that the laws of physics do not in any way prevent the technical requirements of a defensive shield that would protect populations as well as weapons. A total shield should remain our ultimate objective, but there is every reason for us to explore transitional defenses, particularly because the one we have discussed would serve to deter the dangers of a first strike. Defenses against ballistic missiles can be effective without being "perfect," and the technology for this is nearly in hand.

Society must also not forget that ever since the beginning of the scientific age, the organized scientific community has not had a particularly good record of predicting developments that were not part of the common wisdom of the day. In 1926, for example, A. W. Bickerton, a British scientist, said it was scientifically impossible to send a rocket to the moon. In the weapons field, United States Adm. William D. Leahy told President Harry S. Truman in 1945: "That [atomic] bomb will never go off, and I speak as an expert in explosives." And Dr. Vannevar Bush, who directed the Government's World War II science effort, said after the war that he rejected the talk "about a 3,000-mile rocket shot from one continent to the other carrying an atomic bomb . . . can leave that out of our thinking." In the strategic area, as late as 1965, the capable Secretary of Defense Robert S. McNamara wrote: "There is no indication that the Soviets are seeking to develop a strategic force as large as our own."

Our debate and our discussion furthermore must not ignore what the Russians, who have always understood the need for defenses, are doing in space. They have spent more on strategic defensive forces since the anti-ballistic missile (SMB) treaty was signed in 1972 than on strategic offensive forces. Their antisatellite program began nearly two decades ago. The Soviet military is now working aggressively on a nationwide missile-defense system; and it now appears ready to deploy a system capable of defending the country not only against aircraft, but also many types of ballistic missiles. Clearly, the Soviet work in strategic defense has taken place in spite of ABM treaty provisions. The large radar installation in central Siberia expressly violates that treaty with us. Yet the planning for it must have begun many years ago.

The recent Geneva meeting must be considered a major productive result of President Reagan's March 1983 speech announcing that we would begin developing a strategic defense initiative. We are reminded that in 1967 President Lyndon B. Johnson proposed to Prime Minister Aleksei N. Kosygin a ban on ABM's, which was flatly rejected. In 1969, President Nixon proposed to the Congress that our country begin such an ABM program, because the Russians showed little desire to join us in prohibiting such weapons. Shortly after Congress approved that program, the Russians embraced the idea of an ABM treaty. Had our Government not announced its S.D.I. program, we might still be in the cold storage of the Soviet freeze precipitated by their walking out of the Geneva negotiations.

Arms control has been said to be at a dead end, and the stalemate has reflected an impasse in thought and in conception. Our present policy requires both us and the Soviet Union to rely on a theory of mutual annihilation based on a strategic balance of offensive weapons. The American approach has been to depend on deter-

rence alone and not on defending ourselves from Soviet offensive weapons, while the Russians have made it clear by their actions that they intend to defend themselves against our missiles. In any event, what is clear is that mankind must find ways of lifting itself out of this balance of terror. Mutual assured destruction must be replaced by mutual assured survival. Our safety cannot depend on our having no defense against missiles. The proper role of government is to protect the country from aggression, not merely avenge it. It is astounding that a President should be faulted for seeking a formula and an approach that will protect us from the continual threats and terrors coming from the volatile vagaries of adventurism and miscalculation.

Even if a perfect defense of our population should be impossible to achieve —and none of us can be certain of that—the leaders of our Government have a responsibility to seek defense alternatives designed to complicate and frustrate aggression by our adversaries. The very injection of doubt into their calculations strengthens the prospect of hesitation and deterrence. It may not be possible to destroy the world's ballistic missiles, but if we can return them to the status of a retaliatory deterrent rather than a pre-emptive strike we will have reduced the need for the existing large arsenal and thereby the threat of war.

The argument has been made that the S.D.I. is politically harmful because our North Atlantic Treaty Organization allies have not received the initiative with any enthusiasm. Their skepticism is an understandable initial reaction. First of all, our allies were taken by surprise by the President's March proposal of a Strategic Defense Initiative. At times, secret discussions are necessary, but doubtless allied cooperation will be forthcoming in direct proportion to timely and honest consultation. Furthermore, European political leaders feel under great pressure from an activist peace movement that emphasizes traditional arms-control negotiations as a major objective. A new approach, which the Russians criticize as hostile, is, therefore, looked upon as troubling, regardless of its merit.

As to the substance of the initiative, coupling our national security interest with that of our allies is a foundation of NATO defense. Any tendency toward decoupling produces great concern on their part. Western European leaders look upon all security proposals with that criterion in mind. Should America technically succeed in providing a shield against missiles, Eurpoeans wonder whether they would then not be left in an exposed position, facing a superior Soviet conventional military force.

The concerns may be understandable, but will diminish with time and discussion. First of all, President Reagan's call for strategic defense brought the Russians back to the Geneva negotiating table. More important, however, it will become increasingly evident to our friends, as some of the confusion about the technology dissipates, that the ability of the United States to protect its missiles immeasurably strengthens our power to deter and thereby serves to protect our allies. Indeed, such a system is expected to be at least as effective against the SS–20's aimed at western Europe as it is against ICBM's. Finally, a development pulling the world away from the precipice of nuclear terror goes far to help create an encouraging atmosphere for dialogue and agreement, a vital prerequisite for peace.

In light of the above, we reach two basic conclusions:

(1) Developing a stabilizing, limited two-tier strategic defense capability is desirable and called for by the likely strategic conditions immediately ahead. Such a deployment would be helpful both in the military and in the political dimensions. It is a proper response to the challenge posed by political uncertainties and the dynamics of weapons development. The two-layered defense described here can be deployed by the early 1990's. Americans will rest easier when that limited defense is in place, for it will mean that the prospect of a Soviet first strike is almost nil.

(2) A three- or four-layer defense, using such advanced technologies as the laser now under investigation in the research phase of the Strategic Defense Initiative, may become a reality by the end of the century. If this research shows an advanced system to be practical, its deployment may well boost the efficiency of our defense to a level so close to perfection as to signal a final end to the era of nuclear ballistic missiles. A research program offering such enormous potential gains in our security must be pursued, in spite of the fact that a successful outcome cannot be assured at this juncture.

The current debate is necessary. There are many questions, technical and political, ahead of us. For the debate to be constructive, however, we must overcome the tendency to politicize it on a partisan basis. Our objectives should be to find a way out of the current maze of world terror. The President's initiative toward that end is a major contribution to arms control and stability. The aim of making nuclear weapons impotent and obsolete should be encouraged and not savaged.

Senator WARNER. We will now hear from our next witness, Mr. Fred Hoffman.

Mr. Hoffman is well known for his participation in the administration report on future security.

Mr. Hoffman, we welcome you and thank you for your patience in waiting.

We have received a copy of your statement, which will be included in the record in its entirety. Before deferring to my colleague, Senator Hart, I would suggest that maybe you could summarize it and thereby allow the subcommittee the opportunity to pose some questions.

Senator Hart, did you have a statement to make before this witness proceeds?

Senator HART. Oh, no, thank you. I am prepared to hear the witness.

Senator WARNER. Very well, Mr. Hoffman, how would you like to proceed?

STATEMENT OF FRED S. HOFFMAN, DIRECTOR OF PAN HEURISTICS, DIRECTOR OF THE FUTURE OF THE SECURITY STRATEGY STUDY (HOFFMAN REPORT)

Mr. HOFFMAN. I would like to proceed as you suggest, Mr. Chairman.

Mr. Chairman, members of the subcommittee, thank you for the opportunity to present my views. I would like to reiterate, as I say in my prepared statement, that my appearance here is to present purely my personal views.

What I would like to do is to touch briefly on some of what I consider to be the salient points in my prepared statement.

The first relates to the strategic significance of the SDI and, even more important, the implications of our strategic concepts for our assessment of SDI.

The second will attempt to deal with some of what I consider to be some misleading stereotypes now prevalent in the discussion of SDI and, specifically, will raise the question of what it means to protect populations.

The third will be to summarize what I consider to be the principal implications of my views for the conduct of the SDI.

I am particularly glad to be giving this testimony at a time that is approaching the second anniversary of President Reagan's speech which initiated the SDI.

In this time, there has been what I consider to be a partial clarification of some of the issues raised by that speech. In particular, I think it has become clearer that no one, friend of SDI or foe, apart from the U.S.S.R., is now opposing a research program of some sort in the area of strategic defenses.

On the other side, I think it has become clearer that the administration has not and does not now propose any very early systems development decisions, let alone systems deployment.

So the issue that we now have before us is what kind of research program ought we to be conducting and for what purpose. But this would not be sufficient to explain the high level of interest that has been accorded to SDI.

DOCTRINE OF MUTUAL ASSURED DESTRUCTION

The President's speech clearly touched a nerve in the domestic public, among our allies, and in the Soviet Union. To understand why the response was so sharp, I think we need to look at the strategic issues raised by the President's speech.

Those issues concern a set of views that are commonly known as the doctrine of mutual assured destruction. This has been a doctrine that has become increasingly prevalent in public discussions of nuclear strategy since the 1960's, and it is explicitly the U.S. basis for the SALT process.

The principal elements of the doctrine are, first, that the essential role of nuclear weapons is to deter attack by nuclear weapons; second, that any use of nuclear weapons is inevitably suicidal and should be suicidal, so as to avoid the temptation to use nuclear weapons; and, third that anything that interferes with the so-called assured destruction capability of either side is inherently destabilizing—it leads to incentives to preempt in a crisis and it leads to an arms race in the long run.

Now, many of the proponents of this doctrine object to hearing it called a doctrine but refer to it as a fact. This observation I characterize as having a grain of truth within a mountain of confusion.

The grain of truth is the vast destructive potential of nuclear weapons. The mountain of confusion relates to the policy prescription for the United States—namely, that we should conduct our planning programs so as to make MAD a fact, or the assumption about the Soviet Union—that they in fact—do conduct their plans and programs along the lines envisioned by mutual assured destruction.

On both our side and the Soviet side, those are policy choices and not facts of nature. There is nothing inevitable about them. As a matter of fact, they are clearly false as a description of Soviet plans and programs. On the U.S. side, three successive administrations have made attempts to avoid MAD.

The reason for my belief that MAD is not an adequate description of Soviet plans and programs is to be found in the character of their programs rather than in the character of their rhetoric. Their programs, as distinct from their rhetoric, spend vast sums on defenses—air defense, ballistic missile defense, and civil defense emphasizing the survival of their leadership and the continuity of the Soviet State. All of these collectively denote a Soviet belief and a Soviet insistence that, if nuclear war should come, the Soviet State must survive it.

This is inconsistent with the mutual assured destruction theory.

My particular reason for spending this much time on strategic doctrine is that it has fundamental implications for the strategic defense initiative, and I do not think that these implications have fully been appreciated either by the opponents or, necessarily, by some of the supporters of the SDI.

The first and most obvious of the implications of the mutual assured destruction theory is that defenses must be nearly leak proof to be useful. This follows from two observations. First, if you are trying to protect population, according to this view, it is pointless to have a defense that cannot do better than destroy more than 99

percent of an incoming attack because if there are 10,000 warheads coming at you and if even only 1 percent get through the defenses, then, they point out, this means 100 warheads, nuclear warheads, on American cities.

There is a remarkable implication in that statement that often is overlooked, and that is the assumption that the Soviets have, in fact, dedicated their entire attack to destroying American cities, a clearly suicidal act on their part.

There is no reason to believe that attacks on American population would be an important part of Soviet targeting policy, not because of any compassion for American population but because it does not serve Soviet strategic aims. If once you have accepted that fact, the question of protecting population takes on a fundamentally different aspect from the one that envisions an attack with the bulk of the Soviet force aimed primarily at cities.

I will come back to this.

DEFENSES ARE DESTABILIZING

A second implication that follows from the MAD viewpoint is that defenses are destabilizing. I will return to this. The third is that it accords defenses only a role in what is called damage limiting, that is to say, in hedging against the failure of deterrence and no role in deterring attack, because the only thing that MAD recognizes as having deterrent value is a threat to the enemy's population.

Now, in fact, everything we know about the Soviet Union suggests that that is an inappropriate view of them. It is rather remarkable how little attention has been focused by proponents of a doctrine that is primarily concerned with deterrence, on a careful consideration of what might motivate an actual Soviet leader to contemplate seriously the use of nuclear weapons.

There is very little explicit discussion of that. It is not a subject on which anybody can profess certainty; but I think it is absolutely essential for anybody who wants to think about nuclear strategy to ask himself that question: What circumstances would prompt a Soviet leader seriously to consider the use of nuclear weapons and for what purposes?

My own view on that is that what might prompt them to consider the use of nuclear weapons is the prospect of an intense confrontation with a high probability of conflict or the actual involvement by the Soviet Union in a nonnuclear conflict with us.

Under those circumstances, I believe the Soviets might seriously consider the possible use of nuclear weapons to terminate that conflict quickly and decisively before it goes on and escalates into a nuclear conflict in any case.

If they attempt to do that, the prime motivation will be to destroy those general purpose forces that make it possible for us to continue to confront them and to oppose them.

They will obviously face an agonizing question as to whether or not to attack our nuclear forces under those circumstances or to attempt to deter the use of nuclear forces after attacking the critical general purpose force targets.

I will not profess any particular belief on how that would go other than to note that they might conduct any one of a wide variety of attacks with the purpose of bringing a conflict to a decisive and, from their point, satisfactory, conclusion.

If they did so, and if they attacked a widespread target system, the result would be a great deal of collateral damage to our civilian population.

One of the purposes of defense, the prime purpose of defense, would be to deter them from such attacks by denying them the prospect of any certainty in accomplishing their objectives; and, if deterrence failed, a prime purpose of defenses would be to reduce the collateral damage to civil population from the attacks on military targets.

NUCLEAR WINTER THREAT

If there has ever been question in the past about the likelihood of direct and massive attacks on cities, what we are currently learning about the possiblity of nuclear winter makes such attacks appear very, very unlikely for the future.

If, as appears likely, the nuclear winter threat appears to have some reality—and there is a good deal of uncertainty about it—the question of our retaliation to attacks, massive attacks on cities, will become irrelevant. The Soviets will be committing suicide directly by attacking our cities. There is nothing about the heirs of Karl Marx, the followers of Lenin and the survivors of Stalin to suggest that they are at all suicidal. I do not believe that they would plan and conduct such attacks.

We need to evaluate SDI within a framework such as the preceding one rather than that of MAD. When we adopt a plausible framework of beliefs about Soviet incentives, several major conclusions follow. One is that it is not necessary to have essentially leak-proof defenses in order to effectively deter such attacks. Relatively moderate, though robust, levels of defense capability can make such attacks extremely unattractive and unappealing to anybody who contemplates them.

Second, there is no sharp distinction between protecting military targets and protecting population. Both this view of Soviet targeting strategy and a number of the technical characteristics of the kinds of defenses being considered by the SDI mean that the defenses could simultaneously protect combinations of military targets and population against likely kinds of attacks.

If we accept that less than leak-proof defenses can be useful, then, in turn, major implications follow for the kind of SDI program we want to see conducted.

Some have proposed an approach to managing the SDI Program along the lines of a "long pole in the tent" approach. If what you want is to achieve either an essentially leak-proof defense or nothing, then you erect the long pole in the tent first. You work on the toughest problems, the most time consuming, the most technically risky problems first because, unless you can deal with those, nothing will be worth having. So you devote your resources to those problems first.

The problem with such an approach is that it is an all or nothing approach, and it is attempting a very difficult task, so there is a significant possibility of coming up empty-handed. In any case, it is very clear that such an approach will take a very long time to produce useful results.

If, instead, you believe that moderately capable defenses can be useful, then you follow what some have called an evolutionary approach, and you try to identify what Secretary Weinberger has referred to as transitional deployment options, options that may become available before a full and fully effective system will be technically available, but which can be, upon evaluation, in terms of their costs, their vulnerability to counter measures, and their compatibility with our strategy, can be found to be useful.

Such an attempt, such an evolutionary process I believe is the best prospect for achieving the purposes that President Reagan enunciated in his speech 2 years ago. In that speech, he referred to the hope and the intention to make nuclear weapons impotent and obsolete.

I submit that by making them less useful, you can make them obsolete long before we can make them impotent. I believe making them obsolete in the sense of reducing their utility is a vital American interest. Thank you.

[The prepared statement of Mr. Hoffman follows:]

PREPARED STATEMENT OF FRED S. HOFFMAN

THE ROLE OF SDI IN U.S. NUCLEAR STRATEGY

Mr. Chairman, Members of the subcommittee, thank you for the opportunity to present my views on the Strategic Defense Initiative (SDI). This statement and my remarks represent my personal views. I appear here neither in any official capacity nor as a representative of my employer.

As we approach the second anniversary of President Reagan's speech announcing the SDI, it is useful to review the development of the issue. Critics and supporters alike now recognize that the central question concerns the kind of R&D program we should be conducting. Virtually no one on either side of the issue, here or among our allies, contests the need for research on the technologies that might contribute to a defense against ballistic missiles, and it is clear that the Administration does not propose an immediate decision on full-scale engineering development, let alone deployment of ballistic missile defenses.

Nevertheless, the issue continues to occupy a dominant place in discussions of national security issues and arms negotiations, far out of proportion to its immediate financial impact (significant as this is), to its immediate implications for existing agreements, (current guidance limits the R&D to conformity with them) and to its near-term impact on the military balance. Reactions by the public and media in this country and among our allies, as well as the public response by Soviet leaders, suggest that the President's speech touched a nerve. Such extreme reactions to a program that has such modest immediate effect suggests that the President's initiative raises basic questions about some deep and essential troubles with the drift of NATO declaratory and operational strategy for the last 20 years, and about the direction in which we need to move during the next 20 years. The debate has only ostensibly been about the pros and cons of spending next year's funds on research and development. That the basic issues have been largely implicit is unfortunate. Entrenched Western opinion resists rethinking a declaratory strategy that has stressed a supposed virtue in US vulnerability. And the Soviets have been campaigning furiously to aid a natural Western resistance to change. The Soviet campaign is also natural since in the 20 year period in which the West has relied on threats of Mutual Assured Destruction, the Soviets have altered what they call the "correlation of forces" in their favor.

The orthodoxy reflected in the SALT process and in much of the public discussion of the SDI is that of Mutual Assured Destruction (MAD)—a doctrine that holds that the only proper role of nuclear weapons on both sides is to deter their use by the

other side, and that they must perform this role through the threat of massive and indiscriminate attacks on cities, designed to inflict the maximum destruction on the adversary's civilian population. On this view, any use of nuclear weapons is and should be clearly suicidal. Anything that interferes in any measure with the other side's ability to inflict "assured destruction" is "destabilizing"—in crises it is supposed to induce preemptive attack and, in the long term military competition, a "spiralling nuclear arms race" with unlimited increases in the potential for indiscriminate destruction on both sides. MAD was the Western, though not the Soviet, strategic foundation for the ABM Treaty and the SALT offense agreements. It is largely unconscious dogma dominating the media discussions of nuclear strategy, SDI, and arms agreements.

Some who advocate this policy like to think of it as not a policy, but a "fact." A supposedly unalterable fact of nature. There is a grain of truth and a mountain of confusion in this assertion. The grain is the unquestioned ability of nuclear weapons to inflict massive, indiscriminate and possibly global destruction. The mountain is the conclusion that this is the way we should design and plan the use of nuclear forces, and even more important, the assumption that this is the way the Soviet Union does design and plan the use of its nuclear forces. The prescription for our own strategy and the assumption about Soviet strategy are not unalterable facts of nature but matters of policy choices in each country. The contrasting US and Soviet choices brought about the relative worsening of the US position.

This is not the place for a detailed critique of MAD, but a summary of its principal deficiencies is essential to assess the potential role for defenses in our strategy. A central point on which most critics and supporters of SDI agree is that the assessment of defenses depends critically on what you want them to do. And what we want them to do depends on our underlying strategy.

MAD as a strategy might have something to recommend it (not nearly enough in my view) if the tensions between the Soviet Union and the United States were restricted to the threat posed by nuclear weapons. Relations between the United States and the Soviet Union have not been dominated by the possiblity of border conflicts between the two countries or the fear of invasion by the other. Rather the post-World War II military competition arose from the desire of the Soviet Union to dominate the countries on the periphery of its Empire and the desire of the United States to preserve the independence of those countries. No nuclear strategy can long ignore the role of nuclear weapons in managing this underlying conflict of interests, nor can it ignore the asymmetry in the geostrategic situations of the two countries. The US guarantees a coalition of independent countries against nuclear attack by the Soviet Union. We have also affirmed in NATO strategy that we would respond to overwhelming nonnuclear attack with whatever means proved to be necessary to defeat such an attack. Do we now mean to exclude a US nuclear response in both these cases? What if the Soviets launch a nuclear attack, but one directed solely at our allies and which avoids any damage to the US? How long can an explicitly suicidal nuclear response remain a credible threat in the eyes of our allies or the Soviet Union?

On the Soviet side, there is abundant evidence that they have never accepted MAD as a strategic basis for their military programs (in contrast to their rhetoric designed to influence Western opinion). They continue to maintain and improve, at massive cost, air defense forces, ballistic missile defenses and protective measures for their leadership and elements of their bureaucracy intended to ensure the continuity of the Soviet state. Their military strategy has increasingly focused on qualitative improvements to their massive forces intended to give them the ability to win a quick and decisive military victory in Europe using their nonnuclear forces to attack our theater nuclear forces based outside the theater. Deterring a suicidal use of nuclear force is not very difficult. They have steadily improved the flexibility of their own nuclear forces in what Lt. Gen. William Odom, a leading professional student of Soviet military thought, has called their "strategic architecture." They design that architecture for the pursuit of Soviet political goals as well as military operations.

They clearly wish to dominate on their periphery and to extend their influence over time. By creating conditions that weaken ties between the United States and other independent countries they serve both ends. They clearly prefer to use latent threats based on their military power, but have shown themselves willing to use force either directly or indirectly and in a degree suited to their political goals. They regard wars, especially long and large wars as posing great uncertainties for them. Because they cannot rule out the occurrence of such wars they attempt to hedge against the uncertainties in their preparations. There is no reason to suppose that

their plans for the use of nuclear weapons are inconsistent with their general approach to military planning.

From the Soviet point of view, Western public espousal of MAD is ideal. Western movement away from such a strategy based on indiscriminate and suicidal threats would increase the difficulty of Soviet political and strategic tasks. The consequences of Western reliance on threats to end civilization can clearly be seen in the increasing level of Western public anxiety about a nuclear cataclysm. While the incumbent governments among our allies have successfully resisted coercion, trends in public opinion and in the positions of opposition parties give us little reason for comfort. In the US as well, public attitudes reflected in the freeze movement will make it increasingly difficult to compete with the Soviets in maintaining parity in nuclear offensive forces. The Soviet leaders have reason to believe that the West will flag in its efforts to make up for the ground it lost in the quantative offense competition. Proponents of MAD have also impeded and delayed qualitative improvements in the name of "stability." Finally, a broad and increasing segment of the public is questioning the morality and prudence of threats of unlimited destruction as a basis for our strategy.

The specific relevance of MAD to the assessment of SDI is best illustrated in the assertion by critics of the hopelessness of the SDI's task. They observe that if even one percent of an attack by 10,000 warheads gets through the defenses, this means 100 nuclear weapons on cities and that for more likely levels of defense effectiveness, the ballistic missile defenses would be almost totally ineffective in protecting cities. They generally leave implicit the remarkable assumption that the Soviets would devote their entire (and in this example, presumably undamaged) missile force to attacks on cities, ignoring military targets in general and not even making any attempt to reduce our retaliatory blow by attacking our nuclear offensive forces. If the Soviet attack, for example, devoted 2/3 of their forces to attacking military targets then only 1/3 of the warheads surviving a defense like a boost phase intercept system would be aimed at cities. In one particularly remarkable exercise of this sort, the authors concluded that defenses would cause the Soviets to concentrate their forces on our cities, even if their attack were to result in nuclear winter.

Such a bizarre assumption suggests the absence of serious thought about the objectives that might motivate Soviet leaders and military planners if they ever seriously contemplated the use of nuclear weapons. Whatever we may think of theheirs of Karl Marx, the followers of Lenin and the survivors of Stalin, nothing in their background suggests suicidal tendencies. Certainly, their strictest ideological precepts call for the preservation of Soviet power and control. Neglectof the actual motivation of our adversaries is particularly strange in a strategic doctrine that professes to be concerned with deterrence. Despite the fact that deterrence is in the mind of the deterred, those who espouse MAD rarely go beyond the assumption that the attacker's purpose is to strike preemptively before he is attacked.

MAD doctrine takes it as axiomatic that to deter such a Soviet attack we must threaten "assured destruction" of Soviet society. A consequence of this view is that only offensive forces can directly contribute to deterrence. Defensive forces can contribute only if they are useful in protecting our missile silos and the "assured destruction" capability of the missiles in them. Beyond this ancillary role in deterrence, MAD relegates defenses along with offensive counterforce capability and civil defenses to the role of "damage limiting" if deterrence fails. But since our damage limiting capability diminishes Soviet assured destruction capability, eliciting unlimited Soviet efforts to restore their deterrent, MAD dismisses damage limiting (and with it defenses) as pointless and destabilizing.

To recapitulate, acceptance of MAD doctrine implies for SDI:

Defenses must be essentially leakproof to be useful;

Defenses can at best serve an ancillary role in deterring attack;

Defenses that reduce civilian damage are inherently destabilizing.

Even a leakproof defense would not satisfy the last condition. Together these three conditions inplied by MAD are an impenetrable barrier—a leakproof defense against SDI. Since I have indicated above reasons for rejecting MAD as a doctrine, I believe we should reexamine each of these in turn.

Most important, if defenses must be leakproof to be useful, then the odds of success for the SDI R&D program are much lower than if lesser levels of effectiveness can contribute to our security objectives. The record is replete with instances of faulty predictions about the impossibility of technological accomplis hments by those with the highest scientific credentials, and we should view current predictions about the impossibility of effective ballistic missile defenses in the perspective of that record. Nevertheless, if everything in a complex and diverse R&D program

must work well to derive any benefit, the odds of success will be low and the time required very long.

The critics compound the problem further by demanding that the SDI research program prove and guarantee at its outset that the defenses that might ultimately be developed and deployed will be able to deal with a wide variety of ingenious, but poorly specified and, in sone cases, extremely farfetched countermeasures. Critics can produce countermeasures on paper far more easily than the Soviets could produce them in the field. In fact, the critics seldom specify such "Soviet" countermeasures in ways that seriously consider their costs to the Soviet Union in resources, in the sacrifice of other military potential, or the time that it would take for the Soviets to develop them and incorporate them into their forces. The countermeasures suggested frequently are mutually incompatible.

If, instead, we replace MAD with a view of deterrence based on a more realistic assessment of Soviet strategic objectives, we arrive at a radically different assessment of the effectiveness required for useful defenses and of the appropriate objectives of the SDI R&D program. The point of departure ought to be reflection on the motives that might induce Soviet leaders and military planners to contemplate actually using nuclear weapons. The test of deterrence would come if we and the Soviet Union found ourselves in a major confrontation or nonnuclear conflict.

In such circumstances, Soviet leaders might find themselves facing a set of alternatives all of which looked unpleasant or risky. If, for example, they lacked confidence in their ability to bring a nonnuclear conflict to a swift and favorable conclusion, they might consider ensuring the futility of opposing them by a militarily decisive use of nuclear weapons. A decisive nuclear attack in this sense might or might not have to be "massive," in the sense of "very large." Its primary motivation would be the destruction of a set of general purpose force targets sufficient to terminate nonnuclear resistance. If Soviet leaders decided that the gains warranted the risks they would further have to decide whether to attack our nuclear forces or to rely on deterring their use in retaliation. The extent and weight of such an attack would be a matter the Soviet leaders would decide within the context of a particular contingency, based on their assessment of our probable responses.

The alternative risks they would face would be the prospect of nuclear reta liation to an early nuclear attack on one hand; on the other hand, those of gradual escalation of a nonnuclear conflict in scope and violence with the ultimate possibility of nuclear conflict in any case. In either case their primary concern would be to achieve military victory while minimizing the extent of damage to the Soviet Union and the risk of loss of Soviet political control. Their targets would be selected to contribute to these goals. Wholesale and widespread attacks on civilians would not contribute but would only serve to insure a similar response by the large nuclear forces remaining to us even after a relatively successful Soviet counterforce attack. And this does not even take account of the possibility that, should they launch a massive attack on cities, that might trigger nuclear winter, making our retaliation irrelevant.

The magnitude of collateral damage to Western civilians from a Soviet attack with military objectives would depend on the extent of Soviet attack objectives and the weight of attack required to achieve those objectives. Like us, they have been improving the accuracy of their weapons and reducing their explosive yield. As this trend continues, motivated by the desire for military effectiveness and flexibility in achieving strategic objectives, they will become increasingly capable of conducting effective attacks on military targets while limiting the damage to collocated civilians and while remaining below the threshhold of uncertainty of global effects that would do serious harm to themselves. At present, a Soviet attack on a widespread set of general purpose force and nuclear targets would undoubtedly cause very great collateral damage but could be conducted so as to leave the bulk of Western civil society undamaged and to remain safely under the threshhold for a major climatic change affecting the Soviet Union.

We should judge the utility of ballistic missile defenses in the light of their contribution to deterring such attacks and their ability to reduce the collateral damage from such attacks if they occur. The relevant question for the forseeable future is not whether defenses should replace offensive weapons or whether a combination of militarily effective and discriminating offense and defenses will better meet our strategic requirements for deterrence and limiting damage.

This change in the criterion by which we judge defenses from the one imposed by MAD has profound consequences for the level of effectiveness required of defenses, for the treatment of uncertainty about defense effectiveness and for the terms of the competition between offense and defense. Instead of confining the assessment to the ability of defense to attain nearly leakproof effectiveness, a realistic consideration of

the role of defense in deterrence recognizes that an attacker will want high confidence of achieving decisive results before deciding on so dangerous a course as the use of nuclear weapons against a nuclear-armed opponent. Analysis will show that defenses with far less than leakproof effectiveness can so raise the offensive force requirements for attacks on military target systems that attacks on limited sets of critical targets will appear unattractive and full-scale attacks on military targets will require enormous increases in force levels and relative expense to achieve predefense levels of attack effectiveness and confidence in the results. Because of an attacker's desire for high confidence in a successful outcome, he must bear the burden of uncertainty about defense effectiveness and is likely bias his assumptions toward overestimating it. This is particularly important for his willingness to rely on sophisticated countermeasures such as those liberally assumed by critics of the SDI.

In addition, the technical characteristics of the defenses that are contemplated in the SDI would pose particularly difficult problems for a Soviet attack planner. A particularly prevalent and misguided stereotype in current discussion contrasts "an impenetrable umbrella defense over cities" with a hard point defense of silos as though these were the only choices. Reality offers more types of targets and defenses than are dreamt of in this "city-silo" world. The preceding discussion has attempted to show the importance of general purpose force targets in motivating a possible nuclear attack. With respect to the characteristics of future defenses, the technologies pursued under the SDI have the potential for a multi-layered defense which begins with boost phase intercept, continues in the exo-atmospheric midcourse phase and terminates with systems for intercept after reentry into the atmosphere. Each successive layer is more specific in terms of the target coverage it provides, but none is effectively so circumscribed that it is properly described as a point defense.

This means that defenses can simultaneously protect several military targets and can simultaneously protect military targets and collocated population. The problem this poses for the attacker is that he cannot, as he could against poin t defenses, economize in his use of force by predicting which defenses protect which targets and planning his attack precisely to exhaust the defense inventory (even assuming that he can afford to forego attacks on some military targets). Moreover, to the extent that there is redundancy in military target systems (or in their possible unknown locations), and the defense can identify the targets of particular enemy warheads in midcourse, or terminal, phase (as it can), the defense can defend targets "preferentially." The offense would have to treat all targets as equally defended by such a concentrated defense. This greatly enhances the competitive advantage of the defense.

Another implication of the foregoing discusion is that defenses do not come in neat packages labelled "protection of military targets" and "protection of civilians." Warheads aimed at military targets will, in general, kill many collocated civilians and defenses that protect against such attacks will reduce civilian casualties. Again, in contrast to the kind of nightmare attack assumed by MAD theorists, when we consider more realistic Soviet attacks, effective but far from leakproof defenses can protect many civilians against collateral damage. If, moreover, a Soviet attack planner knows that we will protect collocated military targets more heavily and he must choose between attacking similar targets some of which are collocated and others of which are isolated, he will opt for the isolated targets if he wishes to maximize his military effectiveness (the reverse of what is generally assumed by critics of defenses). When we understand that the problem of protecting civilians is primarily the problem of dealing with collateral damage, it becomes clear that we do not need leakproof defenses to achieve useful results. The more effective the defenses, the greater the protection, but there is no reason to expect a threshhold of required effectiveness.

Another charge levied against defenses is that they are "destabilizing." The prospect of leakproof defenses is allegedly destabilizing because they present an adversary with a "use it or lose it" choice with respect to his nuclear offensive capability. Defenses with intermediate levels of effectiveness are also held to be destabilizing because they work much better if an adversary's force has previously been damaged in a counterforce strike, intensifying incentives for preemption in a crisis. The first charge hardly needs response. Leakproof defenses, if they ever become a reality, are unlikely to appear on short notice or all at once. The Soviets know that they can live under conditions of US nuclear superiority without any serious fear of US aggression because they have done so in the past. In fact, they survived for years under conditions of US monopoly. They can also and are pursuing defense themselves, and undoubtedly will continue. The notion that they would have no choice

for responding to US defenses other than to launch a preventive war is not a serious one.

The crisis stability argument is also a weak one. The analysis generally advanced to support it is incomplete and inadequate to determine the strength of the alleged effect because it is unable to compare meaningfully the importance of the difference between striking "first" and striking "second" with the difference between either and "not striking at all." Such analyses ignore, therefore, one of the most important elements of the theory of crisis stability contained in the original second-strike theory of deterrence. Moreover, since defenses would contribute to deterrence by denying achievement of Soviet attack objectives, it would at least be necessary to determine the net effect of strengthening deterrence with the effect of intensifying incentives to preempt and this the analysis cannot do. Finally, the argument focuses on the wrong culprit. The grain of relevance in the argument is its identification of the problems presented by vulnerable offensive forces. It then superimposes partially effective defenses on the vulnerable offensive forces and concludes that the defenses are destabilizing. But it would be a virtuoso feat to design SDI type, multilayered defenses that would not, willy-nilly, reduce the vulnerability of the offensive nuclear forces, and it would certainly be possible by proper design to reduce that vulnerability far enough to eliminate the so-called destabilizing effect while realizing the other benefits of defenses.

Turning next to the effect of introducing defenses on the long-term military competition, we once again encounter the charge that defenses are destabilizing. A common assertion is that the offense will always add force to overwhelm the defense with the net result of larger offensive forces and no effective protection. This stereotyped "law of action and reaction" which flourished in the 1960s and early 1970s was also supposed to imply that if we reduce defenses, the Soviets will inevitably reduce their offenses. It has no basis in theory, and it has been refuted by reality. The United States drastically cut its expenditures on strategic defense in the 1960s and 1970s while the Soviets tripled their expenditures on strategic offense. After we abandoned any active defense against ballistic missile attacks even on our silos, the Soviets deployed MIRVs for the first time and increased them at an accelerating rate. The action-reaction theory of the arms race led to some of our worst intelligence failures in the 1960s and early 1970s.

The effects of US defenses on the incentives governing Soviet offensive forces are likely to depend on the terms of the competition as they are perceived by each side. The incremental increase in effort or force size by the offense required to offset an increment of effort or force in the defense (the "offense-defense leverage") is particularly important in determining the character of the long-term response by the offense to the introduction of defenses. The leverage in turn as suggested by the foregoing discussion, is extremely sensitive to the strategic criterion we adopt, the specific targets being protected, and the characteristics of the defenses. When we assess the role of defenses within a strategic framework like the one outlined above and take account of the defense characteristics that could result from the technologies pursued under the SDI, the leverage is radically shifted in favor of the defense compared with the results suggested by evaluations within the MAD doctrine and under the misleading stereotype of defense characteristics prevalent in public discussion.

More fundamentally, ballistic missiles now offer an attack planner a degree of simplicity and predictability associated with no other weapon system. Planning a ballistic missile attack is much more like building a bridge than it is like fighting a war. The distinguishing characteristic of warfare, and active and unpredictable opponent, is missing. Introduction of defenses will change that radically and the change will reduce the strategic utility of ballistic missiles, now the keystone of US and Soviet military forces. President Reagan called for defenses to make ballistic missiles "impotent and obsolete." Defenses of relatively moderate capability can make them obsolete to a military planner long before they are impotent in terms of their indiscriminate destructive potential.

If this point is reached or foreseen, the incentives governing negotiations over arms agreements will be fundamentally changed in a direction offering much more hope of agreement on substantial reductions in forces on both sides. Moreover, the growing problems of verification of limitations on nuclear offensive systems makes it increasingly difficult to foresee the possibility of agreeing to sizable reductions in the absence of defenses. One of the contributions of defenses can be to increase the ability to tolerate imprecision in the verifiability of arms limitations.

The point of view advanced here has major implications for the conduct of the SDI R&D program as well as for the criteria we should apply to evaluating its results when we approach the decision for full-scale engineering development and de-

ployment. If we adopt the MAD view of the role and utility of defenses and require essentially leakproof defenses or nothing then we will conduct the SDI on what has been called the "long pole" approach. We will seek first to erect the "long pole in the tent," that is, we will devote our resources to working on those technical problems that are hardest, riskiest and that will take longest and we will delay working on those things that are closest to availability. The objective of this approach will be to produce a "fully effective" multi-layered system or nothing. Unfortunately such an approach increases the likelihood that we will in fact produce nothing and it is certain that it delays the date of useful results into the distant future.

If instead, as argued here, we believe that defenses of moderate levels of capability can be useful then we will conduct SDI in a fashion that seeks to identify what Secretary Weinberger has called "transitional" deployment options. These may be relatively near term technological opportunities, perhaps based on single layers of defenses or on relatively early versions of technologies that can be the basis for later growth in system capability. Or if they are effective and cheap enough they might serve for a limited lifetime against early versions of the Soviet threat while the SDI technology program continues to work on staying abreast of qualitative changes in the threat. Such an approach would incorporate a process for evaluating the transitional deployment options in terms of their effectiveness, their robustness against realistic countermeasures, their ability to survive direct attack on themselves, their cost and their compatibility with our long-term strategic goals. Such an approach represents the best prospect for moving toward the vital goals enunciated by President Reagan two years ago.

Senator WARNER. Thank you, Mr. Hoffman. Senator Hart, why don't you be the first questioner.

Senator HART. Thank you, Mr. Chairman.

THEORY OF DETERRENCE

Mr. Hoffman, I gather that the thrust of your testimony is that the theory of deterrence has failed or is about to fail, is that correct?

Mr. HOFFMAN. I would restate that. It is becoming politically less satisfactory if by the theory of deterrence you mean mutual assured destruction. I do not equate deterrence with mutual assured destruction.

Senator HART. Nor do I.

So, let's forget about mutual assured destruction and just talk about deterrence.

You rather poetically said that the Soviets, the Russians, are not suicidal. That is an essential element to a theory of deterrence. What is it that you think might tempt them to launch a first strike today or 5 or 10 years from now, leaving SDI aside, that has not tempted them to do that for the last 20 or 30 years?

Mr. HOFFMAN. I tried in my remarks to indicate the circumstances under which they might be tempted to use nuclear weapons. Let me restate them.

Let me, however, first say this. Having been one of those who was involved in producing the term "second strike capability," I find the current usage of "first strike" and "second strike" to be less and less illuminating, and by attempting to categorize these things rather than dealing with them concretely, to have the prospect of being misleading.

The circumstances under which the Soviets might attempt something as risky as the use of nuclear weapons would be ones in which all prospects look bleak. Those circumstances, as I indicated, would arise if we and they were either on the verge of or involved in an actual conflict as we might be, say, in the Persian Gulf or some such place.

Senator HART. I understand all those war scenarios. I am really talking about deterrence failing when the Soviets come to believe that an American President will not retaliate. Is that not the case?

Mr. HOFFMAN. Right.

RETALIATION TO SOVIET FIRST-STRIKE

Senator HART. What has led you to believe that an American President might not retaliate in the 1980's or 1990's or the twenty-first century when, in fact, the Soviets presumably have believed that for the last 20 years?

Mr. HOFFMAN. "Retaliation" is, again, a kind of portmanteau word.

One of my concerns is to make sure that the President has available a suitable response to any Soviet use of nuclear weapons. I would consider an attack on Soviet cities an unsuitable response to any Soviet attack except an all-out attack on American cities and, therefore, I believe that the threat of attacking Soviet cities is not a relevant response to any likely Soviet act.

It is for this reason that I question the role of such attacks in much of the current discussion. And, you see, most of the SDI discussion has implicit within it the assumption that if nuclear weapons are going to be used, they are going to be used massively against cities. I do not believe that.

Senator HART. It seems to me, then, that you are saying that if you were President and the Soviets struck first at our hard targets or our war-fighting capability, you would not retaliate against their cities, and, therefore, that no President would, and, therefore, deterrence fails.

Mr. HOFFMAN. Again, it depends on what they have done. I don't know what I would do if they conducted widespread attacks on our cities.

Senator HART. No; I said on hard targets.

Mr. HOFFMAN. On hard targets. Well, let me ask you——

Senator HART. No; you are the witness. I am asking you.

Are you transferring your own personal opinion that you would not retaliate against Soviet cities to any future President?

Mr. HOFFMAN. To anyone I would vote for.

I would not vote for a President I thought was suicidal.

Senator HART. I do not believe that is what the question was, Mr. Hoffman. We have already been attacked.

Mr. HOFFMAN. We have already been attacked, but all of our cities are intact. Our cities are undamaged in your assumption.

Senator HART. Oh, I see. That includes Colorado Springs, Omaha, and Washington, DC.

Mr. HOFFMAN. Well, would you destroy the rest of the United States——

Senator HART. I am asking you the question.

Mr. HOFFMAN. Well, then, I would not destroy the rest of the United States if Colorado Springs were destroyed, no.

Senator HART. Well, I probably would not vote for you for President.

SDI CREATES CONFUSION

You said that the SDI touched a nerve. I think it has confused people, and, with all due respect, I don't think your testimony clarifies that confusion because we still do not know what SDI is. I must say I think a part of that is the President's fault and the administration's fault. On the one hand we have the Nitze statement—and I hate to keep bringing it up because I have a notion that my support for the Nitze statement is a kiss of death. But it seems to me that it is the most rational statement yet of what SDI really is. It is a research program trying to develop some technologies which, if they work, offer some promise.

I find it very hard to quarrel with that. Indeed, I think, given the support in Congress for the past number of years for research at a modest level in this area, very few would quarrel with it.

However, we also have the Brzezinski approach where no more research needs to be done before we go into deployment of at least the first level, if not the second level—I take it Dr. Brzezinski is prepared to do both. Finally, we have the third or umbrella concept, the all-out SDI, which I take it you are supporting here. It is that shifting definition of what SDI is that I think has many of us confused.

Mr. HOFFMAN. I think the confusion is a result of the fact that it is a research program at this point and a good deal of the discussion involves the question of what direction the program ought to take.

Research, by its nature, is a matter of dealing with uncertainties and things that we do not know. So I am not very much in favor of trying to make some hard and fast categorizations at this point.

Let me offer a concrete illustration.

I sympathize with a good deal of what Dr. Brzezinski said. He, in turn, was talking in hard and fast terms about a first layer and a fourth layer.

Well, it turns out that if some of the things being pursued in SDI, some of the technical things being pursued in SDI, are successful and yield a way to do a good job on exoatmospheric discrimination, what Dr. Brzezinski referred to as the first layer will also be a second layer. It will be able to shoot at the missiles after their boost phase and in their so-called busing phase and in the postboost phase.

Senator HART. Do you agree with him that we ought to go forward and start producing and deploying those systems?

Mr. HOFFMAN. I do not believe that we are at a position where we can make a judgment for deployment. What I do agree with him about is that the technologies being considered under SDI vary tremendously in the degree of difficulty, in the degree to which they are in hand or a gleam in the eye. Some of them are much better understood than others. I think the ones that are better understood should be assessed for their utility in producing partial defenses. I think that assessment needs to be as tough as any other similar assessment.

Senator HART. Thank you very much.

Thank you, Mr. Chairman.

Senator WARNER. Senator Thurmond?

Senator THURMOND. Thank you, Mr. Chairman.

TWO-TIERED NONNUCLEAR STRATEGIC DEFENSE

Mr. Hoffman, prior to your testimony, Dr. Brzezinski stated that he was confident that a two-tiered nonnuclear strategic defense could be deployed within the next 10 years. Do you agree with that assessment?

Mr. HOFFMAN. I'm sorry. I did not hear your characterization of the defense. A two-staged defense, did you say?

Senator THURMOND. Dr. Brzezinski stated that he was confident that a two-tiered nonnuclear strategic defense could be deployed within the next 10 years. I just wondered if you agreed with that assessment.

Mr. HOFFMAN. I think that is pushing it. I think if we pushed the technologies very hard, we might be able to bring ourselves to an IOC within 10 years if the research is successful, but from what I hear, that is pushing the availability somewhat.

Senator THURMOND. Mr. Hoffman, one of the drawbacks to the ballistic missile defense proposal 15 years ago was that the costs of proliferating defensive systems greatly exceeded the costs of increasing offensive weapons. Would that be the case with the SDI?

Mr. HOFFMAN. I believe not, but that judgment, in turn, depends critically on what you want the defenses to do. If you want to get an essentially leak-proof defense against attacks on cities, I think that judgment is correct. If you want a defense that will protect against collateral damage and will deter attack, then I think it is wrong, and the kinds of technologies being pursued in SDI can give a very strong advantage to the defense.

Senator THURMOND. Mr. Hoffman, would you compare the technical risks for the SDI with those of our original space program or perhaps even the Manhattan Project.

Mr. HOFFMAN. As I attempted to indicate earlier, SDI encompasses a tremendous range of technologies. Some of those are very far out and quite difficult. I am not a technical person, so you are getting secondhand, warmed-over technical views from me.

But my understanding is that some of those might appear to be at least as difficult and problematic as the Manhattan Project appeared to be, and perhaps more so; others are clearly much less uncertain.

Senator THURMOND. Mr. Hoffman, if you had the power to make decisions today, just what would you advocate in the way of defense policy, offensive and defensive?

Mr. HOFFMAN. I think, on the offense side, because I believe that the threats of massive destruction are constantly becoming less useful as an element of U.S. strategy, it is vital to acquire protected, precise, and militarily effective offensive systems that can limit the collateral damage that they do, that can do military tasks in a discriminate way as a part of our posture; and with respect to defenses, I think we should pursue the SDI along the lines of what I have characterized as the evolutionary approach, and pursue it vigorously.

Senator THURMOND. Thank you.

That is all I have for now, Mr. Chairman. Thank you.

Senator WARNER. I see that you have covered the two questions that I had in mind. Therefore I would only ask one remaining question.

SDI COST EFFECTIVENESS

You referred again to Mr. Nitze's speech. That was the question of cost effectiveness. Have you had an opportunity to fully answer that to the extent you feel confident to address that?

Mr. HOFFMAN. I will stay with the last part of your statement.

I do not believe that the state of the understanding of the SDI has proceeded far enough so that we can conduct precise cost and effectiveness calculations at this time.

Senator WARNER. What would the deployment of even a limited U.S. strategic defensive do to the Soviet attack planner's confidence?

Mr. HOFFMAN. Let me answer that in two parts.

In my view of what the Soviets would be about if they ever considered or actually executed an attack, it would make it impossible for them to achieve the kind of objectives that I believe they would find essential. I, therefore, believe that its first effect would be strongly deterrent.

Second, if they attacked, I believe it would force them to concentrate their forces on the highest priority target, and, therefore, by virtue of both concentrating the attack and shooting down a good part of it, I believe that defense could reduce collateral damage.

Finally, in the long-term, because I believe it would make the ballistic missile less militarily useful and less politically useful to the Soviet leaders, it would lead them to look for other ways to accomplish their objectives. I think their first recourse would be to think about and perhaps move to aerodynamic systems. There I agree with Dr. Brzezinski when he said that even if we did not succeed in accomplishing equally effective defenses against aerodynamic vehicles, we would have accomplished a good deal in reducing the instability of the current situation. At present, what the Air Force began referring to years ago as the "compression of time" puts us in a terrible bind and creates intense public anxieties. A defense against ballistic missiles could lighten this burden.

So I think it would force Soviet leaders to look for other means to achieve their strategic objectives, and it would also incline them to be more receptive to proposals to reduce the offensive force sizes on both sides—again, because these forces would be less militarily and politically useful to them.

Senator WARNER. Mr. Hoffman, on behalf of the members of the subcommittee and for myself, I wish to thank you for this effort on your part. We recognize that it is an invasion on your private time and personal affairs. But it has been extremely helpful not only to the Senate but to further a better understanding of this issue throughout the country, and, hopefully, throughout the world.

Mr. HOFFMAN. Thank you. I appreciate that.

Senator WARNER. You have made a great contribution to our Nation's strategic thinking and today is but another chapter.

We appreciate it.

Mr. HOFFMAN. Thank you very much, Mr. Chairman.

Senator WARNER. This subcommittee is adjourned.

[Whereupon, at 4:14 p.m., the subcommittee adjourned, to reconvene upon the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1986

TUESDAY, MARCH 5, 1985

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

AIR-BREATHING DETERRENT

The subcommittee met in open session, pursuant to notice, at 2:06 p.m., in room SR-222, Russell Senate Office Building, Senator John W. Warner (chairman), presiding.

Present: Senators Warner, Wilson, and Glenn.

Staff present: Arnold L. Punaro, staff director for minority; Robert G. Bell, Robert F. Bott, Douglas R. Graham, William E. Hoehn, Jr., and George K. Johnson, Jr., professional staff members; Russell C. Miller, research assistant; and Karen A. Love, staff assistant.

Also present: Romie L. Brownlee, assistant to Senator Warner; Mark J. Albrecht, assistant to Senator Wilson; Allan Cameron, assistant to Senator Denton; Janne E. Nolan, assistant to Senator Hart; Jeffrey B. Subko, assistant to Senator Exon; and Phillip P. Upschulte, assistant to Senator Glenn.

OPENING STATEMENT BY SENATOR JOHN W. WARNER, CHAIRMAN

Senator WARNER. Mr. Secretary and gentlemen, we will commence the hearing.

The subcommittee convenes in open session to receive testimony in support of the fiscal year 1986 request for components of the air-breathing deterrent. These programs, taken as a whole, represent the most versatile leg of our strategic triad.

While they require the largest share of the funding associated with the President's strategic modernization program, they are also the elements of the President's program that provide the quickest return on investment in terms of deployed capability.

Our panel of witnesses this afternoon includes Hon. Thomas E. Cooper, Assistant Secretary of the Air Force for Research, Development and Logistics; Lt. Gen. Robert D. Russ, U.S. Air Force, Deputy Chief of Staff, Research, Development and Acquisition; and Maj. Gen. John A. Shaud, U.S. Air Force, Director of Plans, Deputy

Chief of Staff for Plans and Operations; all of whom have been with us before.

We are glad to see you back. And the subcommittee welcomes Maj. Gen. Harold J.M. Williams, U.S. Air Force, Director of Operational Requirements, Deputy Chief of Staff, Research, Development and Acquisition, who is a new member of this team since last year.

The air-breathing deterrent includes our B-52 forces, for which modifications to modernize the fleet are again requested this year; the B-1B, for which the final increment of aircraft procurement is requested; the advanced technology or Stealth bomber; the air-launched cruise missile; the advanced cruise missile, and the KC-135 tankers, for which reengining kits are again requested.

Today's hearing, which will continue in closed session after a brief opening statement by our panel, will provide the record that this subcommittee will use in arriving at recommendations on the overall fiscal year 1986 defense authorization.

Several of the programs in this area will require a subsequent hearing in executive session so that special access information may be considered.

Dr. Cooper and General Russ, members of the subcommittee have received your joint statement, which can be made part of the record.

[The joint statement is printed as part of the authorization hearings, see tactical warfare hearing of March 12, 1985.]

Senator WARNER. The Chair notes that he will have to leave the hearing for awhile about 3:30 to join Senator Goldwater on the floor to introduce the joint resolution to release funds for the MX.

I will insert Senator Thurmond's opening statement for the record.

[The prepared statement of Senator Strom Thurmond follows:]

PREPARED STATEMENT OF SENATOR STROM THURMOND

Mr. Chairman: I would like to add my welcome to our witnesses today and say that it is a pleasure to have you gentlemen here to receive your testimony. The success of our strategic programs in recent years, Mr. Chairman, is largely a measure of your dedicated efforts in articulating the importance of these programs to our national security.

I have been informed that the air breathing portion of our triad is in good shape this year. As we complete the procurement and integration of 100 B-1 bombers into our force structure, we will have a measurable increase in strategic capability. I feel safe to say, however, that my distinguished colleague from California, Senator Wilson, would advocate the greater strategic capability that 200 B-1 bombers would give us. That, unfortunately, does not appear to be a viable option considering the constraints that we must impose on the growth on defense spending.

Senator WARNER. Dr. Cooper, you may proceed as you wish in open session, and we will close the hearing when you deem it appropriate.

STATEMENT OF THOMAS E. COOPER, ASSISTANT SECRETARY OF THE AIR FORCE FOR RESEARCH, DEVELOPMENT, AND LOGISTICS

Dr. COOPER. Thank you, Mr. Chairman.

It is a pleasure for us to be back. We are here today to talk about our program to modernize the air breathing leg of our strategic triad.

Tomorrow we will be back to talk about our program to modernize the ICBM force.

I would like to introduce the gentlemen with me at the table. I think you all know Lt. Gen. Bob Russ. He is no stranger to this subcommittee, having appeared many times before. He is our Deputy Chief of Staff for Research, Development and Acquisition.

We also have Maj. Gen. John Shaud who has likewise been here for the last 2 years. He is our Director of Plans and works for the Deputy Chief of Staff for Plans and Operations.

And Maj. Gen. Harold Williams who will conduct the majority of our briefing today. Major General Williams works for General Russ. He is the Director of Operational Requirements in General Russ' DCS.

If I could, I would like to make a few very brief remarks.

As this subcommittee well knows, our bomber program is designed to maintain the effectiveness of our B–52 force while we are developing and deploying an enhanced bomber capability for the future.

As briefed last year, our plan involves conversion of most of our B–52G's and Hs to cruise missile carriers, producing a hundred B–1B bombers and developing and deploying an advanced technology bomber to meet future challenges and needs.

We are also upgrading the avionics on our F/FB–111 fleet. We are in the process of re-engining our KC–135 tanker fleet.

Mr. Chairman, General Williams will discuss all of these programs in detail in his classified presentation, but I would like to make the following observations in open session.

First, let me say that we are extremely pleased with the progress that we have made in our program. It is indeed going very well. We have recently completed equipping our five squadrons of B–52G's with cruise missiles. We did this in December 1984. We are now in the process of equipping the B–52H's with a similar capability.

The B–1 program is moving apace and is ahead of schedule and within the cost cap of $20.5 billion for a hundred bombers. I think, as you both well know, we rolled out the first production B–1 in September of last year, some 5 months ahead of schedule. We had the first flight of the B–1B in October 1984.

So, all in all, we believe we are doing very well with the B–1 program. Just one point. On June 29 of this year we will deliver the first operational B–1B to Dyess Air Force Base in Texas. The thing that is interesting about that date, is that it is 30 years to the day since we delivered the first operational B–52. So, it has been 30 years since we have deployed a modern bomber.

As far as the ATB program is concerned, it continues to move smoothly forward. As you know, that is highly classified, but what I can offer in open session is that we are maintaining the same schedule as we briefed to the subcommittee last year and that the program is fully funded to meet that schedule. If all goes well, which it is now, we will meet the IOC that we briefed to you last year.

Senator WARNER. And technology is pacing that program and not the budgetary considerations?

Dr. COOPER. That is right, Mr. Chairman.

I think it would be very difficult by adding more money to accelerate the program significantly at this point. That is not to imply we have technological roadblocks in front of you.

Senator WARNER. But are you meeting milestones?

Dr. COOPER. Yes.

Senator WARNER. Those who feel it could be accelerated for any number of reasons should be apprised of the fact that it is the opinion of the Department of the Air Force that technology is pacing?

Dr. COOPER. That is right. Dollars are not. We are very pleased with that. As we mentioned last year, what we can say in open session is that we are moving toward an "early" 1990's IOC.

All in all, Mr. Chairman, we are very pleased with the progress we have made with the bomber modernization program last year. In fact, we are extremely proud of it.

I would be remiss indeed if I did not take this opportunity to thank this subcommittee for your tremendous support over the last several years and you, sir, for your tireless efforts on behalf of modernizing our strategic deterrent.

We greatly appreciate that support and we hope that continues.

With that, I would like to turn the session over to General Russ who is going to give you an overview of the strategic portion of our budget to show you what percentage that is.

Senator WARNER. Before you conclude your opening remarks, again the B-1B program is on target in terms of schedule, milestones and budget?

Dr. COOPER. Absolutely.

Senator WARNER. No deviation anywhere in the program from what was presented last year?

Dr. COOPER. No, not at all. In fact, we may be slightly ahead of the schedule we briefed to you last year on the B-1B. All is going very well on the B-1B program.

Senator WARNER. I congratulate the Department of the Air Force and in particular the witnesses who are here today who were responsible.

Senator GLENN. Thirty years to the day when the B-52 was introduced? The more pertinent figure is when the last B-52 was delivered.

Dr. COOPER. I believe that was 23 years ago. I believe it was 1962 when the last one was introduced in the inventory. It has had remarkable resiliency since then, though.

Senator WARNER. Mr. Wilson, do you have any opening observations?

Otherwise, we will proceed.

Senator WILSON. No, I will have some questions later. Thank you.

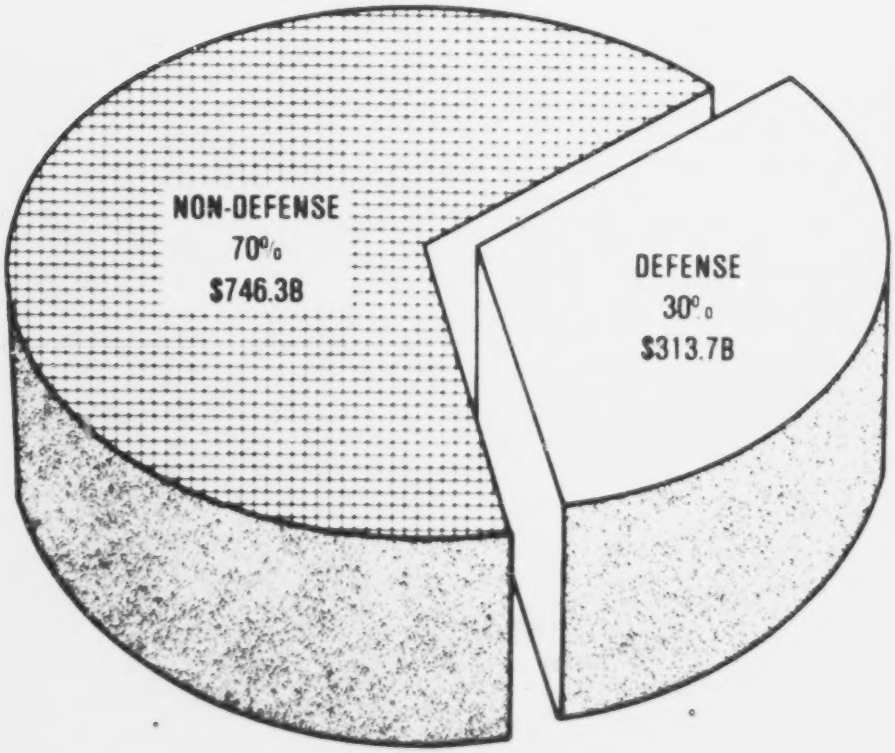
Dr. COOPER. General Russ' presentation can be made in open session. When we get to General Williams, we will have to close to go through his formal presentation.

STATEMENT OF LT. GEN. ROBERT D. RUSS, U.S. AIR FORCE, DEPUTY CHIEF OF STAFF, RESEARCH, DEVELOPMENT, AND ACQUISITION

General RUSS. It is a pleasure to be back, Mr. Chairman.

What I thought I would do this afternoon is provide a short overview of our budget in order that we may put the strategic funding into perspective.

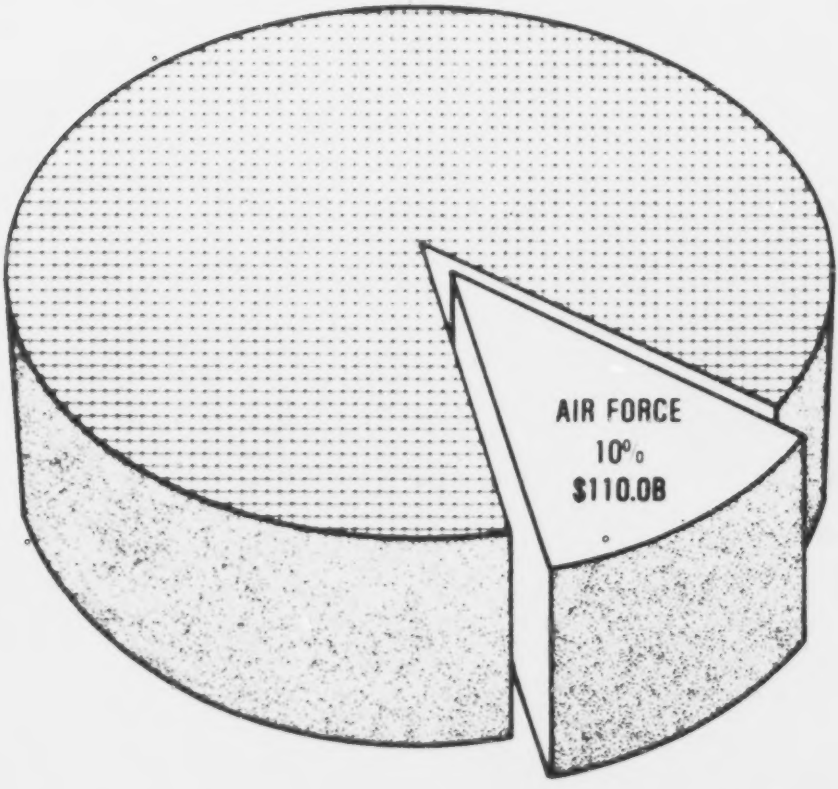
FISCAL YEAR 1986
FEDERAL BUDGET AUTHORITY REQUEST
TOTAL: $1060.0B



As you know, the Department of Defense budget this year is some $313.7 billion and it represents about 30 percent of the total Federal budget.

FISCAL YEAR 1986
FEDERAL BUDGET AUTHORITY REQUEST

TOTAL: $1060.0B



To look at what share that the Air Force has, it is $110.0 billion in budget authority. Now, as you know, we actually work in Total Obligation Authority [TOA], and the $110.0 billion really equals 110.3 billion in TOA.

FISCAL YEAR 1986 AIR FORCE BUDGET PRIORITIES

Fiscal year 1986 priorities reflect commitment to "stay on course" and continue addressing improvements most vital to combat capability:
Modernize strategic forces (offensive and defensive);
Improve readiness and sustainability of general purpose forces;
Increase airlift capability;
Modernize and expand tactical forces; and
Improve ability to operate efficiently and effectively in space.

Now, with that amount of money, the Air Force lays down some priorities.

Our first priority was to stay on course that we had laid out in 1980 to improve our vital combat capability.

Strategic forces, both offensive and defensive, were our number one priority, and improving the readiness and sustainability of our general purpose forces has been achieved.

Then, increasing airlift capability followed by modernizing and expanding our tactical forces.

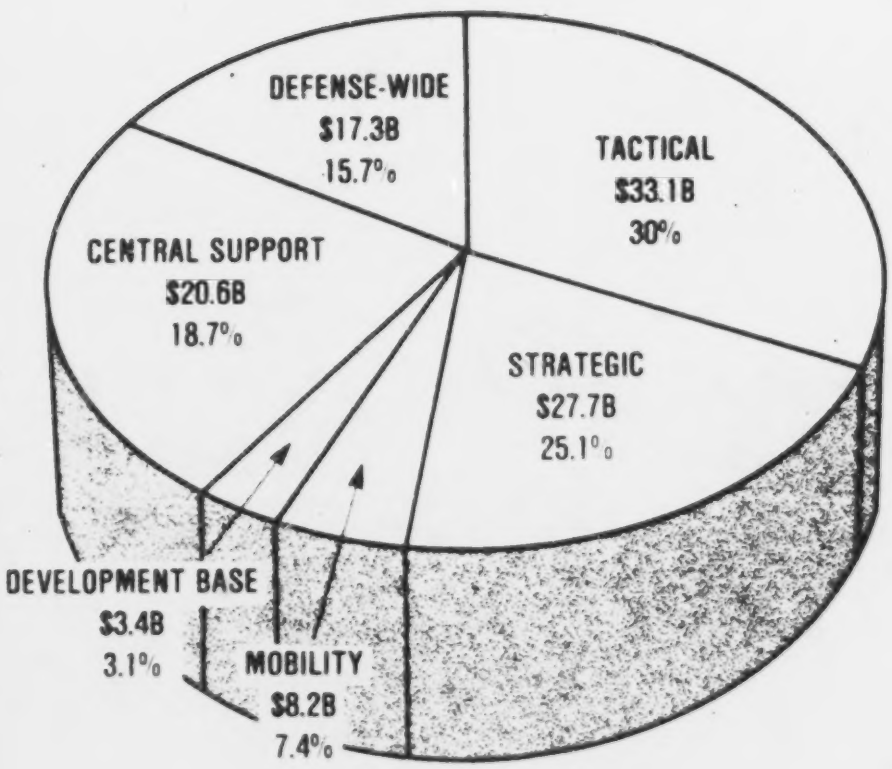
And finally, improving the ability to operate effectively and efficiently in space.

The reason I include the space at the end and put an "and" between it is primarily because space encompasses all the other areas in some way or another, in effect, both the strategic and tactical and general purpose areas.

Now, I would be remiss if I did not say that overriding all these priorities is our emphasis on our need to take care of our people. So, if you ask me what is the highest priority, I would say our people. But in the force business, I would say our strategic forces.

USAF FISCAL YEAR 1986 BUDGET REQUEST
BY MISSION AREA

TOTAL: $110.3 BILLION



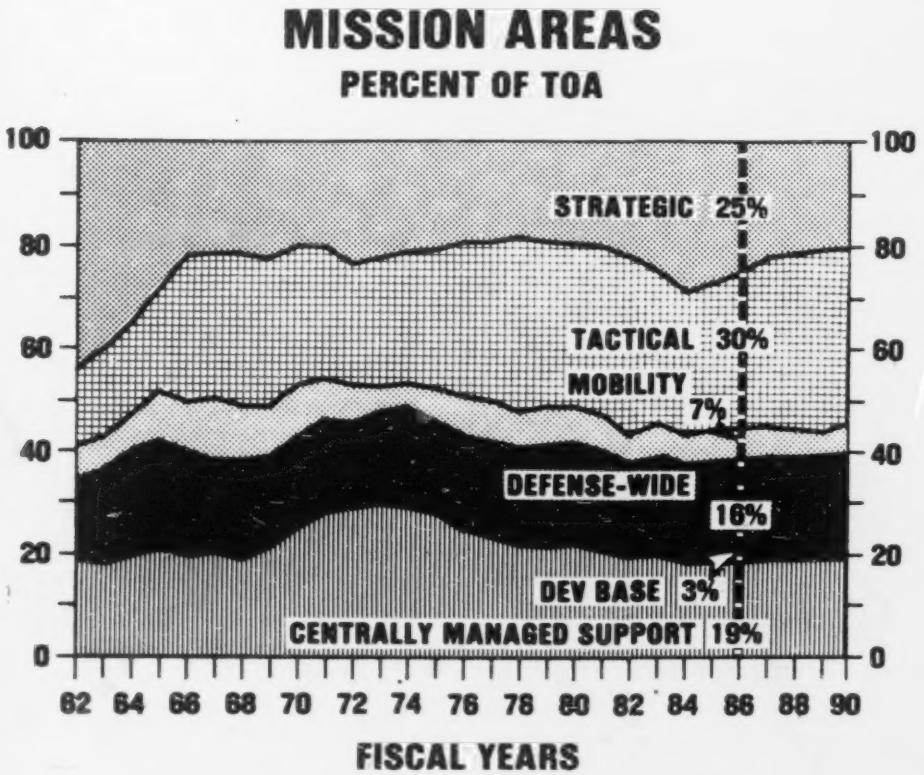
With that $110.3 billion that we are requesting, the pie is divided as indicated in this chart. The largest section goes for the tactical forces or some 30 percent.

Defense-wide is 15.7 percent. As you know, that includes such things as space launch support, communications, space booster, MILSTAR, and some classified programs, as well as others. The central support is about 18.7 percent. That includes our PCS travel, training for our new pilots, our health care, some of our skill training, and other accounts.

The development base is slightly larger than 3 percent. That is our seed corn for our future systems. Our technology base programs are better known as the technology base. Mobility is 7.4 percent.

Finally, our strategic forces are 25 percent of the Air Force budget.

Now, I might say that when looked at in light of the total Department of Defense budget, strategic forces account for 15 percent. The reason the Air Force has 25 percent, as you well know, is that we have two legs of the triad and, therefore, it is a larger percentage of the Air Force budget.

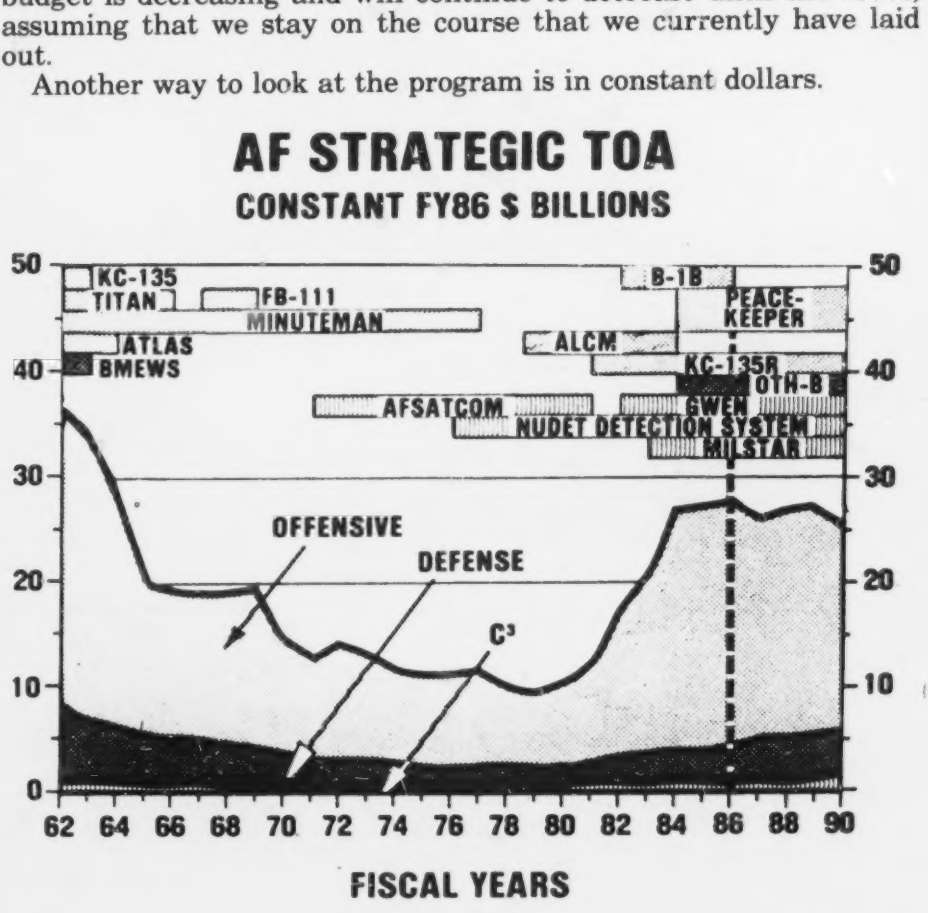


It is well to look at the next slide which shows over time what percentage the strategic has taken out of our budget. You can see back in the early sixties that the percentage was over 40 percent of the budget and during the seventies it slimmed down.

This year we are 25 percent of the budget and we expect to go down to 23 percent of the budget next year, and down to about 21 percent of the budget in 1990.

So, in essence, the strategic funding as a percentage of the budget is decreasing and will continue to decrease until the 1990s, assuming that we stay on the course that we currently have laid out.

Another way to look at the program is in constant dollars.

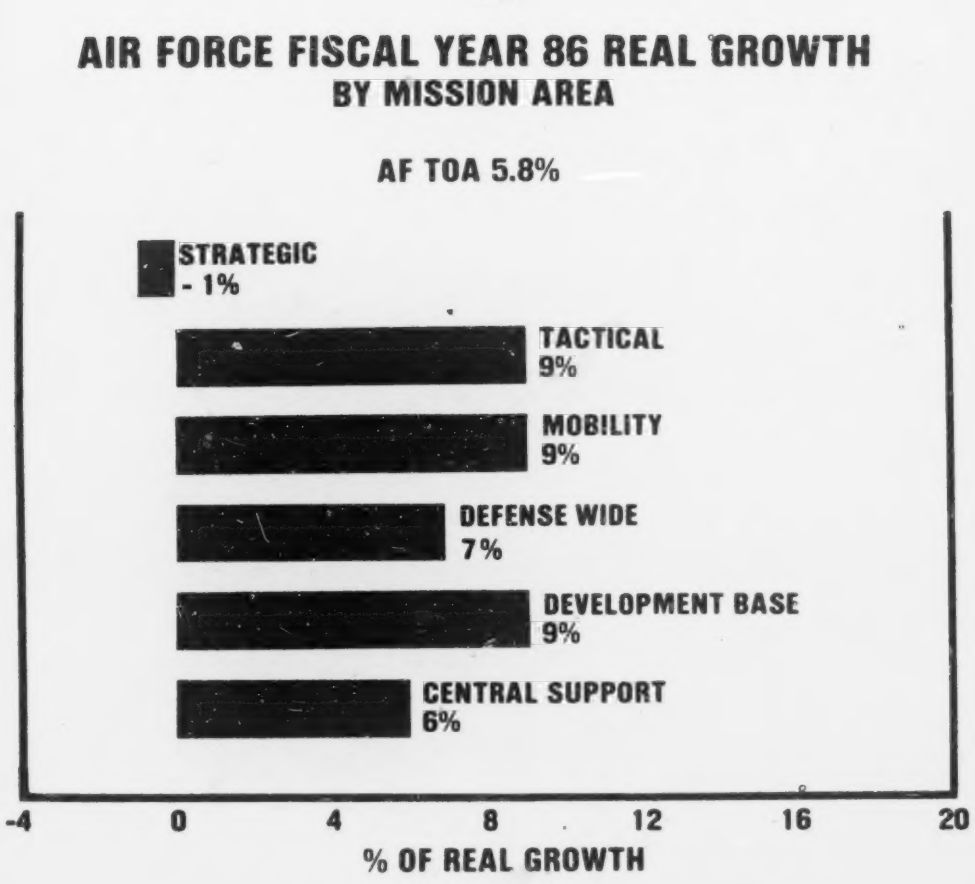


This chart is useful to describe that. Across the top of the chart you see the various systems and they represent the years in which we have procured those systems.

Starting with the left-hand side of the chart, in 1962 you can see that we were spending some $36 or $37 billion on strategic forces. That rapidly dropped and the reason it did is because we phased out some of our old systems, B–58s, B–47s, also KC–97s, and other systems.

During the time frame of the 1970s we have what I call a bathtub effect shown on this chart. The times were pretty tough for the strategic forces. Then starting in 1980 additional monies were put on the strategic forces and you can see how we built up until in 1986 the budget request was for some $27.7 billion.

After 1986, as you can see, the funding level actually goes down somewhat.



Now, the final chart I have, sir represents growth, real growth. Real growth in the Air Force budget this year is 5.0 percent.

However, in the strategic area you can see we really have a negative growth or a minus 1 percent. The reason for that is because the B–1B is over the hump.

Actually this year we are requesting $1.6 billion less than we did last year and the MX is also over the hump and we are down some $200 million from what we requested last year. Put in perspective, on these large programs with the 1985 appropriations, 48 percent of our MX is funded, 78 percent of our B–1 program is funded and some 95 percent of our ALCM is funded.

If the President's budget is approved, the MX will be 67 percent funded, the B–1, 99 percent funded, and the ALCM, 97 percent funded.

So, in summary, I think what I have tried to show is that the strategic modernization is our top priority and strategic funding is 25 percent of our budget and declining and we have had no real growth from 1985 to 1986 in our funding for strategic forces.

What I would like to do now, sir, is to turn it over to General Williams and allow him to go through some of the individual programs to give you an update on where we are specifically on our major programs and what we see in the future.

Senator WARNER. If I might interrupt for a moment, I am going to join Chairman Goldwater on the floor to introduce the MX and make a statement. In my absence, Senator Wilson and Senator Glenn will carry on.

Mr. COOPER. Senator, before we proceed with General Williams, we need to close at this point.

Senator WILSON [presiding]. That is fine, Dr. Cooper.

[Whereupon, at 2:21 p.m., the subcommittee proceeded in executive session.]

EXECUTIVE SESSION

The subcommittee met in executive session, at 2:22 p.m., in room SR-222, Russell Senate Office Building, Senator Pete Wilson, presiding.

Present: Senators Thurmond, Warner, Wilson, Hart, Exon, and Levin.

Staff present: James F. McGovern, staff director and chief counsel, Arnold L. Punaro, staff director for the minority; Robert G. Bell, Robert F. Bott, Douglas R. Graham, William E. Hoehn, Jr., and George K. Johnson, Jr., professional staff members, Russell C. Miller, research assistant, and Karen A. Love, staff assistant.

Also present: Romie L. Brownlee, assistant to Senator Warner; Henry D. Sokolski, assistant to Senator Quayle; Mark J. Albrecht, assistant to Senator Wilson; Allan Cameron, assistant to Senator Denton; Janne E. Nolan, assistant to Senator Hart; Jeffrey B. Subko, assistant to Senator Exon; Peter D. Lennon, assistant to Senator Levin; and Phillip P. Upschulte, assistant to Senator Glenn.

Senator WILSON. Are you ready to proceed?

Dr. COOPER. We are ready to proceed.

Senator WILSON. Go ahead, General Williams.

STATEMENT OF MAJ. GEN. HAROLD J.M. WILLIAMS, U.S. AIR FORCE, DIRECTOR OF OPERATIONAL REQUIREMENTS, DEPUTY CHIEF OF STAFF, RESEARCH, DEVELOPMENT, AND ACQUISITION

General WILLIAMS. Good afternoon, Senator Wilson and Senator Glenn.

I appreciate the opportunity to provide you with an overview of our strategic modernization program on the air breathing leg.

With your permission, I will stand. I think I can make myself heard and I think I can address the slides a little more conveniently that way.

I will review first the bomber leg, the B-1B, ATB and then move into the air-launched cruise missiles, short-range attack missile, modernization of that particular missile that we are looking for and advanced cruise missiles.

For the first time we will be able to mention here in closed session that which heretofore has been special access. Then I will move into the KC-135.

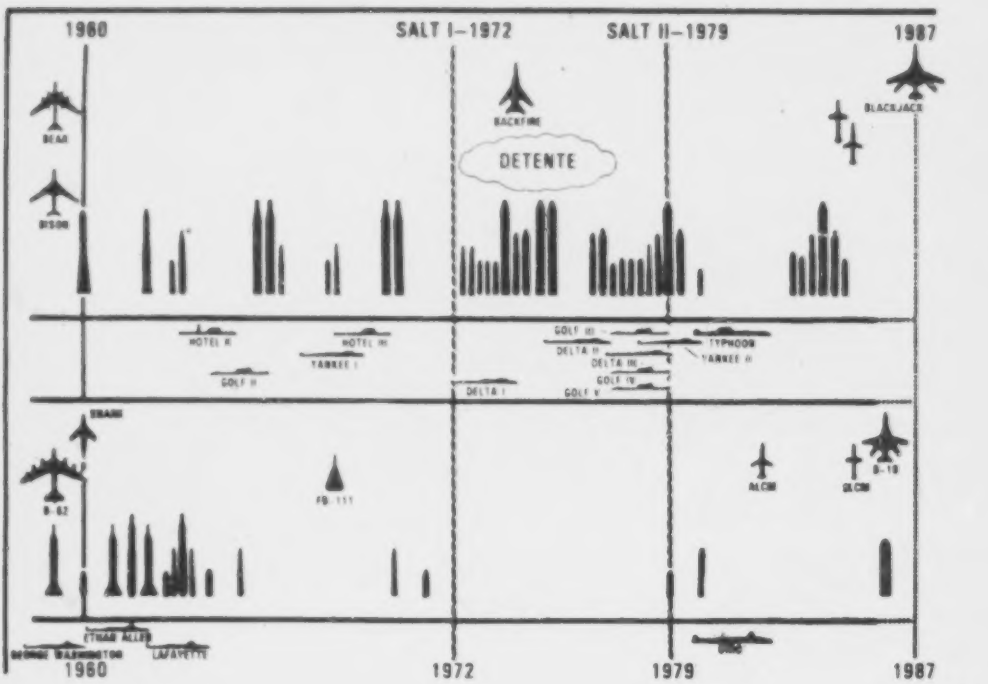
I think we can provide you with an overview in the time that we have.

Dr. COOPER. Before you proceed, Senator, I might want to underscore what General Williams said.

Let me restate that we have taken out of the special access compartment the funding level for the advanced cruise missile. You will see that funding today. We continue to maintain the technical details of that missile in the special access department.

Senator WILSON. Thank you. Please proceed.

STRATEGIC SYSTEMS IN PERSPECTIVE



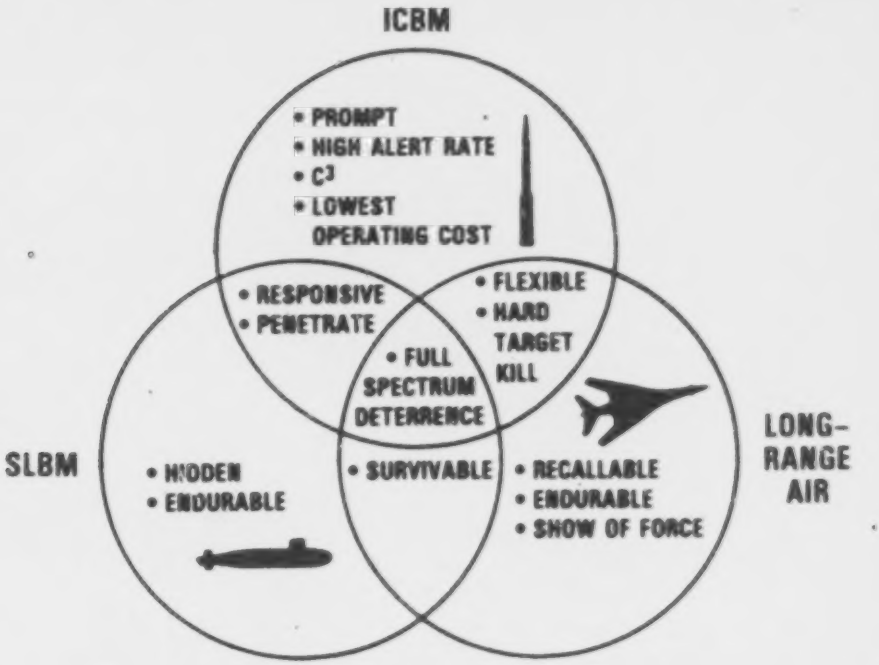
General WILLIAMS. You are quite familiar with the balance in the strategic arena. Over the past several years, 2 or more decades, the Soviets have produced significant programs in this arena, both in terms of the ICBM as well as their bombers and certainly their submarine-launched ballistic missile capability while we have failed to fund any until we began this strategic modernization program.

We do not have the first B–1B nor MX in the field at this time. [Slide deleted.]

In a more numbers game look at the number of strategic delivery vehicles, this column represents the total of the United States and the total of the Soviet Union. You can see an emphasis on their ICBMs and SLBMs and our approach with the bombers with [deleted] respectively.

They outnumber us significantly, but we are moving to redress that balance to a degree.

STRATEGIC TRIAD CHARACTERISTICS



We believe that our modernization is well based on the concept of the triad. I am sure you understand all we are trying to say is that the very strengths and weaknesses provide a solid foundation for the country to present to the Soviets a good deterrence which will cause them to view other options than the violence or threat of violence to solve differences.

We think the long-range air-breathing arm of the triad represented by bombers and cruise missiles does provide us with a flexible and hard-target kill and durable show of force which has served us well over several years.

PRESIDENT REAGAN'S STRATEGIC MODERNIZATION PROGRAM

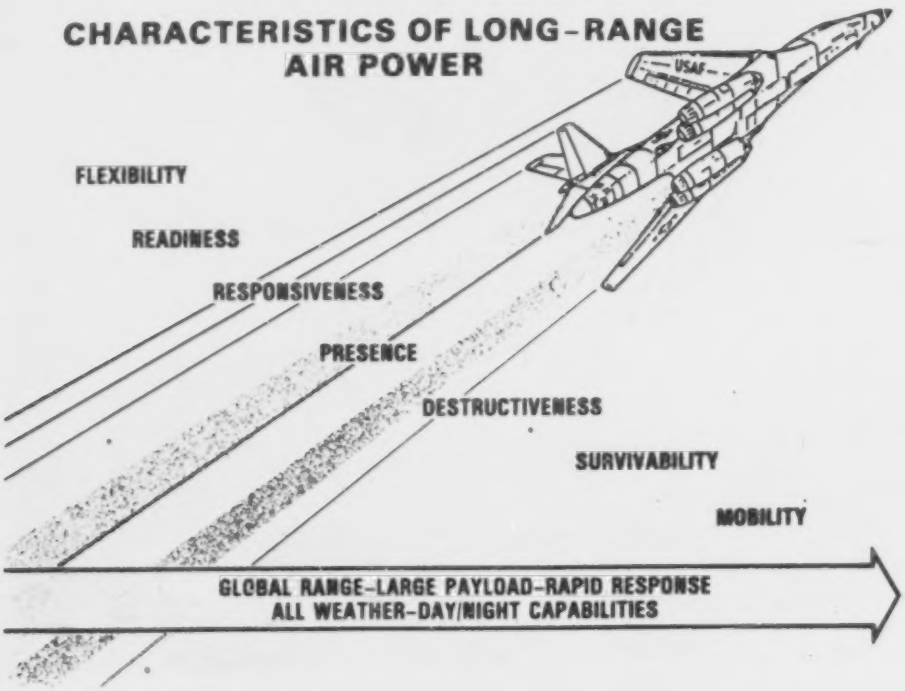
"To revitalize our strategic forces":
Improve C³;
Modernize the bomber force;
Deploy new SLBMs;
Improve the ICBM force, and
Improve strategic defense.

With that in mind, President Reagan did ask us to modernize the bomber force as part of the effort to revitalize our strategic forces.

This afternoon I will address specifically the B–1 bomber, cruise missile and advanced technology bomber and a few other munitions.

"Arms control negotiations—in particular the Soviets' willingness to enter agreements that enhance stability—are heavily influenced by ongoing programs."—Scowcroft Commission, April 1983.

We think, as has been said in the Scowcroft Commission report, the strategic modernization program is not contradictory to arms control. We think it enforces it, offers good incentive to do just that.



I will focus most of my comments on the bomber leg of the triad. The inherent characteristics of the bomber with global range, heavy payload and the day and night capability and opportunities to reach any part of the globe in a matter of hours under tight control by National Command Authority are inherently vested in the bomber leg of the triad.

[Slide deleted.]

By way of review, again looking at trends, the Soviet-U.S. trends, U.S. bombers from 1962 through 1989 with projections in 1985 to 1989, we see a continual production level off in the late 1970's, but a build up by the Soviet Union to the point where they will have more bombers than we do in the future.

[Slide deleted.]

More specifically, if we look at strategic long-range air power on the left, you see the numbers with FB-111s, B-52 ALCM carriers, B-52Gs which are not ALCM carriers and B-52H modified at this time for ALCM launch.

We see distribution of long-range air power vested in [deleted] the Bear and Bison.

I should add there is a new variant of the Bear which I believe has been briefed, the Bear H, which does carry the air-launched cruise missile.

Senator WILSON. What is the difference in the naval and the Soviet air force version?

General WILLIAMS. The naval aviation portion, [deleted] we have not had reason to conclude that they are directed against land targets. They are directed against naval targets and their training is directed for that mission.

However, their range and capability, their payload capability and the fact that basically they are a variant of the Backfire causes us to list them as a long-range air capability.

The Backfire up here for the Soviet air forces does demonstrate the capability for long range. The naval Backfires do not.

Another way of looking at the balance of the long-range air power, if you use age as a surrogate for level of modernization, you can see that the Soviets have a younger bomber force vested in their Backfire fleet and in their new Bears as compared to the B-52 and we have discussed the age of the B-52 already.

[Slide deleted.]

One more quick view projecting into 1994, 1995. [Deleted] bombers and that inventory is shown with Backfires, Bears and Bisons. In the mid-1990's timeframe we see a buildup in Blackjack, the Bear and then the Soviet aviation Backfires and the Soviet naval aviation to total [deleted] in the mid-1990's.

One other perspective I think is important to view from the air breathing leg, the bomber leg of the triad. We see that in the distribution of targets assigned each of the three legs of the triad, submarine-launched ballistic missile, ICBM and in this case the bombers where they have only [deleted].

My comment here is simply to say again it shows the versatility and the rationale for the triad to be able to optimize our total deterrent against a would be adversary.

[Slide deleted.]

The bombers also are effective against a wide variety of targets as discussed in their inherent flexibility. We can direct them against almost any target. Depending on the defenses, we can vary the tactics in approach to optimize capability and complicate Soviet defenses. We can force him to make significant investment in stand-off AWACS and fighter forces.

We can shoot and then penetrate, use gravity munitions when appropriate and we can capitalize on our capability to stress their defenses through actual penetration inside the Soviet Union.

[Slide deleted.]

One good measure of the stress and the deterrent value of the bomber force is to look at the amount of budget that the Soviet Union is forced to place in their air defenses against this threat.

Roughly [deleted] of their military budget is invested in defending against the air breathing leg of the triad.

Another measure is [deleted]. This is from the CIA 1984 study. The precision of these numbers may be questionable, but yet the overall magnitude of the numbers is significant.

[Slide deleted.]

Looking to the future as to how our bomber road map may be viewed this year, we have our bomber force, [deleted] and as of June of this summer, we will deploy the first B-1B.

Moving to the right toward the year 1990 we see the growth of the B-1B as we arrive at a 100 total in 1988 for a total of [deleted].

Another way to view it, and this is an important aspect as we view the bomber force functionally as related to the threat.

[Slide deleted.]

Another way of saying we have the bomber tactics and strategy to meet the threat and enhance survivability, we see the B-52, the threat is relatively low and can be managed by the B-52.

As threat increases, we will put the B-52 in a shoot and penetrate role with the B-1 assuming penetration. As this force ages and the threat continues to grow, we will see the B-52 move into a standoff role and the B-1 in a shoot and penetrate role, with the ATB then picking up the penetration role, significantly stressing the Soviet defenses by modification of tactics.

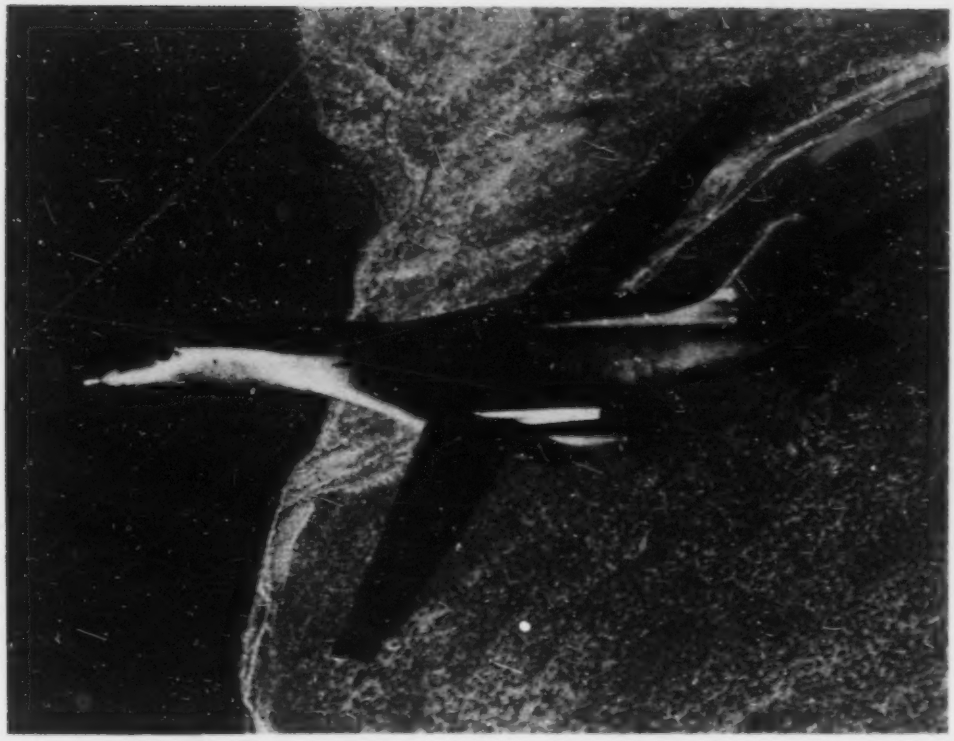
Dr. COOPER. I think that is probably one of the most important slides in the briefing; it shows the interrelationship between the three bombers and how we plan to use them in the future.

As you will notice, we don't show a date on it when we transition the B-52 from shoot to shoot and penetrate. When the B-1 comes on, it can penetrate. Eventually it will be tougher for the B-1 to penetrate. Then we bring the ATB on as a penetrator.

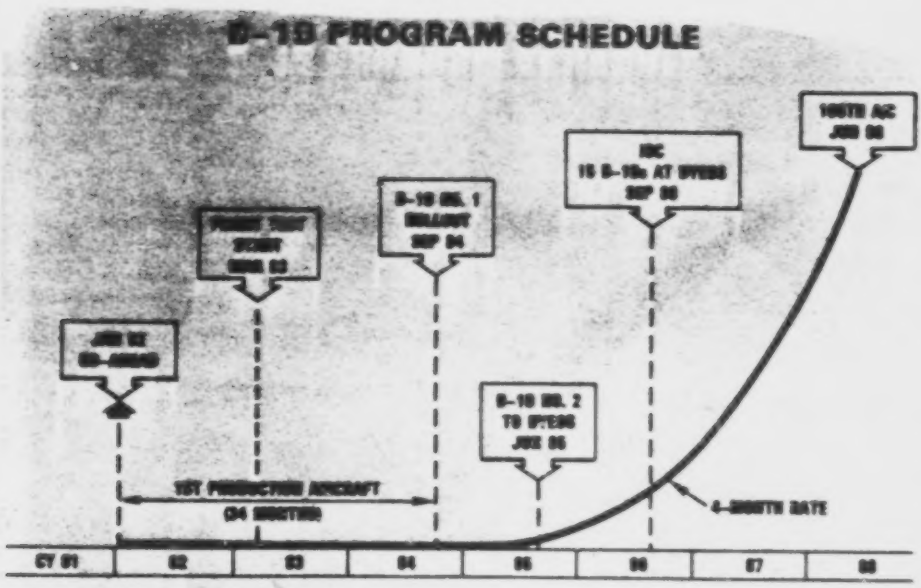
You notice the synergism between the three.

[Slide deleted.]

General WILLIAMS. This was a big day for us, on September 4, when the B-1B rolled out at Palmdale. We are very pleased to have that arrive ahead of schedule.



This shows the B–1B first flight, again ahead of schedule on October 18. The handling properties were proven to be quite good. We had an Air Force team of Lt. Col. Leo Schroeder and Merv Evenson of Rockwell fly it.



Looking at this by way of the calendar, we were given a go ahead in January 1982. Flight test started in March 1983 with the B–1A, No. 2, and B–1A, No. 4. We continued then with the B–1 rollout. The first one will arrive at Dyess in June 1985. That will be B–1B, No. 2.

B–1B, No. 1, will remain in the flight test program. Then with the initial operating capability at Dyess in September 1986. We will have the last aircraft of 100 aircraft delivered to McConnell Air Force base in Kansas in June 1988.

We are on schedule on both. We are slightly ahead of schedule.

[Slide deleted.]

This is B–1B, No. 2. It is in the checkout facility there. When we reach full production we will have been moving four aircraft a month. This aircraft will move out in March. It will be delivered to Dyess in June 1985.

I was just mentioning that this was the B–1B, No. 2. This is the aircraft that will be delivered to Dyess in June 1985.

Senator THURMOND. Is that made in California?

General WILLIAMS. Yes, sir.

Senator WILSON. Assembled in California?

General WILLIAMS. Made all over the country, sir.

Senator THURMOND. Why don't you assemble some in South Carolina? [Laughter.]

[Slide deleted.]

General WILLIAMS. This is B–1B, No. 3, which is moving through the checkout facility. This is No. 4 for wing assembly and No. 5 in the background for fuselage assembly.

[Slide deleted.]

Senator THURMOND. That is the latest B–1, is it?

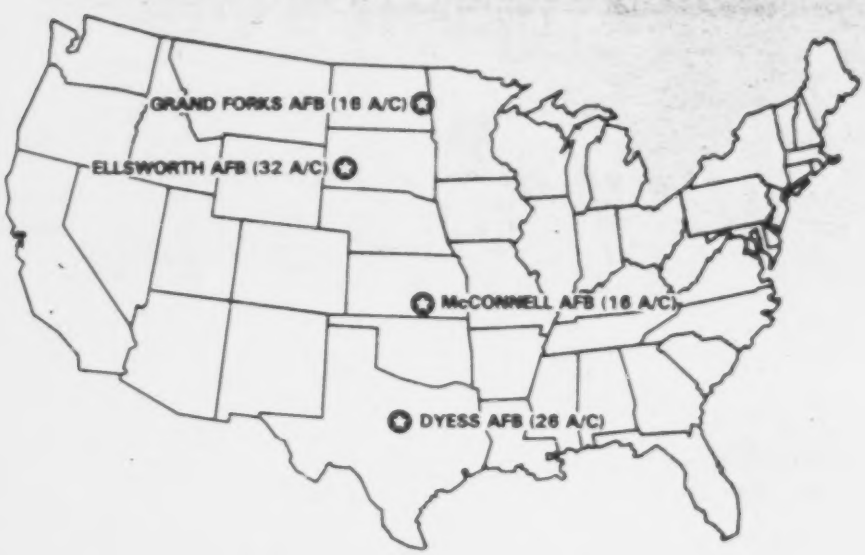
General WILLIAMS. This one here, sir, is No. 3. No. 1 is flying now.

Senator THURMOND. That will be the latest one?

General WILLIAMS. Yes, sir. We want to be sure we show you that we are in a production program for the B-1.

This is No. 6, 7, 8, and 9 in various stages of forward fuselage assembly.

B-1B BASING PLAN



This map shows the bases for deployment of the B-1. Dyess will be the first base. They will receive their first aircraft this summer. We will then go to Ellsworth, then to Grand Forks, then to McConnell with the one hundredth aircraft being delivered to McConnell in 1988 for a full complement, four bases, 100 aircraft.

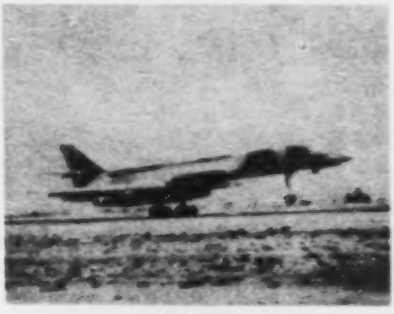
B-1B

($ IN MILLIONS)

	FY 84 & PRIOR	FY 85	FY 86	FY 87	TO COMPLETE	TOTAL
RDT&E	2,180.8	485.0	367.4	138.3	38.3	3,170.8
WPN SYS PROC	10,943.5	7,071.8	5481.8	0	0	23,476.3
QUANTITY BUY	18	34	48	0	0	100
DELIVERIES	0	2	18	48	34	100

FY 86 RDT&E REQUEST
$ 367.4

- AIRFRAME 171.0
- AVIONICS 114.5
- ENGINE 17.5
- OTHER 64.4



FY 86 WPN SYS PROC REQUEST
$ 5481.8

- AIRFRAME 4183.4
- AVIONICS 1471.7
- ENGINE 722.8
- OTHER 1245.0
- ADVANCED BUY CREDIT -2,179.8

SCHEDULE

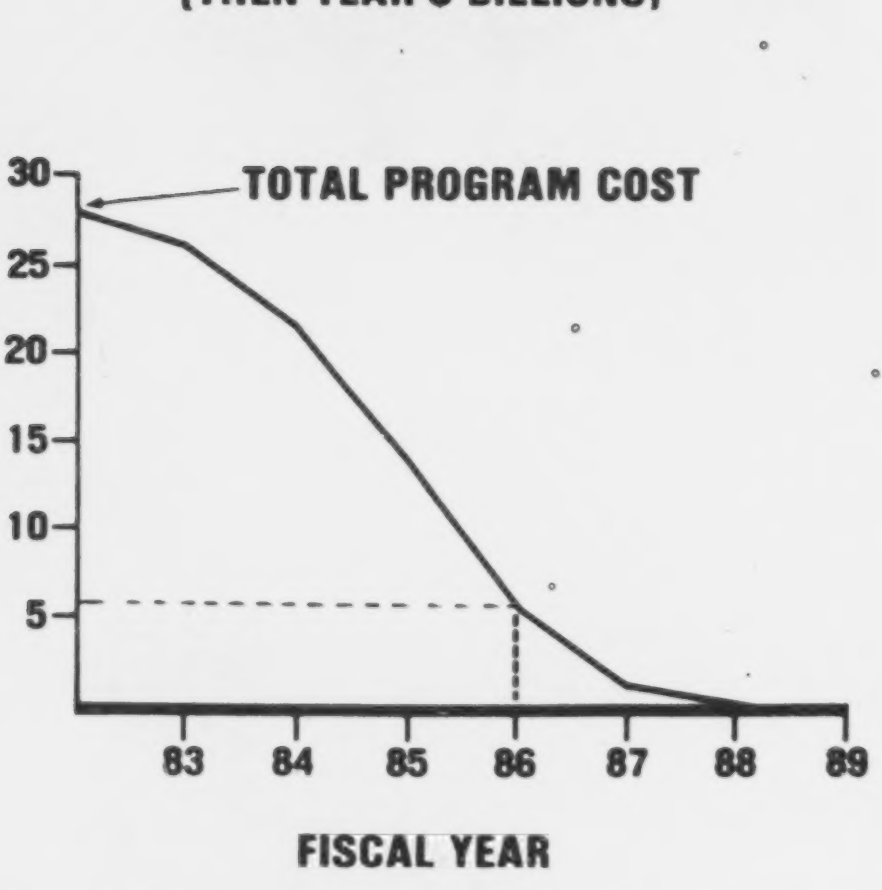
- FES/PROD CONTRACT AWARD JAN 82
- IOC SEP 86
- FOC JUN 88

This year in fiscal year 1986 we continue to request funding, but in this case we are requesting for the last 48 aircraft. We are requesting some RDT&E funds.

Primarily this will be devoted to flight test to include [deleted].

The net request for fiscal year 1986 is $5.5 billion—which reflects a $2 billion credit for advance procurement already funded for long-lead items.

General Russ. It is significant to note on that slide that this is the last year of the B–1B procurement and in 1987 it is zero.



General WILLIAMS. In terms of funding, as General Russ said, at this point we are 85 percent funded and the fiscal year 1986 funds as requested will be 99 percent funded for the program.

Senator WILSON. A point right there, General.

I congratulate the Air Force and the contractor on the fact that you are actually ahead of schedule and within budget, I gather a little under.

Is that because of the multiyear procurement that we have been involved in that you have been able to achieve that?

General WILLIAMS. We realize benefits from the multiyear contract. That is helping us. We have yet to be sure how much that will reduce required funding, since we have not signed the final contract. We won't do that until later this year.

We are uncertain exactly how those numbers will work out, but we have certainly realized some benefits from the multiyear program.

Senator WILSON. You also have driven a very hard bargain?

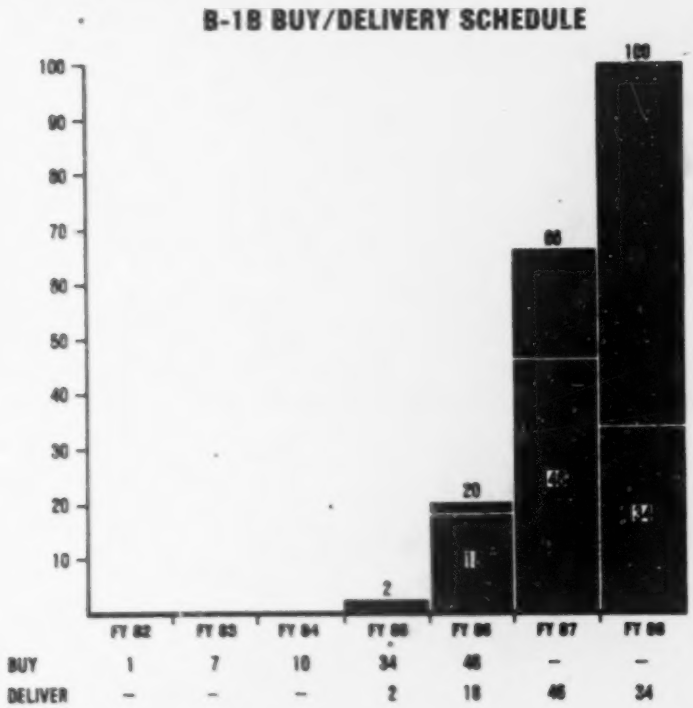
Dr. COOPER. Yes. The prime reason we have been able to meet that goal is because we have had stability in the program.

As you recall, a $20.5 billion cost cap was placed on it by the Congress, the President certified we could meet that cost cap if the funds that were requested were advanced in the amount and on the schedule requested. That has been the case.

We lost, relatively speaking, a few dollars last year, but I think the thing that has done the most to bring this program in within cost is the stability. Certainly the multiyear has helped, no question about that.

We think that has saved at least $800 million. This program enjoys a stability that few of our programs have enjoyed.

Senator WILSON. Thank you.



General WILLIAMS. This chart shows the delivery schedule. We will receive 18 in fiscal year 1986 and 46 in 1987 and 34 in fiscal year 1988 for a total then of 100. We think that is a nice distribution.

We were asked to have IOC prior to 1987. The IOC is in 1986. The last aircraft will be delivered in fiscal year 1988. We are pleased with the program.

Dr. COOPER. I might point out that while this is the last year for production funding for the program, the activity continues to go forward very vigorously for two additional fiscal years.

General WILLIAMS. We have a short movie we would like to show you, Senator, of the first flight that you might find interesting.

[Movie presentation.]

This is roll out on September 4. This is 5 months ahead of contract schedule and 3 months ahead of what the contractor promised us verbally.

This is Secretary Orr, General Gabriel CSAF, and Robert Anderson, the CEO of Rockwell International.

Six weeks later on the October 18 we had the first flight. It took off from Palmdale. As I mentioned earlier, the aircraft handled better than expected. The pilot, Mr. Evenson and Mr. Schroeder were very pleased with it. Both pilots were flying a new airplane.

It shows the aircraft descending, bringing its wings forward. You might note that the wings are moved forward to permit it to land at slower speeds. That is the reason or the rationale for the sweep of the wings, aerodynamic properties based on the position of the wing.

In this case the aircraft will land at about 150 knots. General Russ commented this landing was not nearly as good as he had in his film last year. You can see two bounces.

It is useful to note while flying the B–1B aircraft, we are still realizing benefits from the aircraft B–1A #4 program.

Here it is shown flying at low level to coincide with our efforts to continue testing the avionics, the flying properties, the modifications on the flight control system and the inherent flight characteristics that will be installed and are being put in the B–1B.

[Slide deleted.]

The B–1B is the first aircraft that was designed for low altitude penetration from the floor up. That is important.

The B–52 was designed as a high altitude aircraft. Here you see dropping a B–61 nuclear shape. You see the two pylons there, it missed it by 70 feet. We think that is pretty good accuracy. This shows releasing a short-range attack munition.

I would like to talk briefly about the advanced technology bomber, the follow-on to the B–1B program. It is a long-range strategic bomber, it incorporates advanced technology and it does present a follow-on platform to provide maximum stress to the Soviet defenses.

It will, of course, provide a global response capability across the full spectrum of conflict from nuclear deterrence down to contingency operation.

ADVANCED TECHNOLOGY BOMBER [ATB]

Status

Development is at the fastest prudent pace.
Major contractors are Northrop, Boeing, LTV and General Electric.
Progress is very satisfactory.
Confident we can meet [deleted] 1990s IOC.

Because of the classification, we are limited in what we can comment on today, but we are prepared and will respond to an opportunity to provide you with more specific information on this program.

Development is proceeding at the fastest prudent pace. The contractors are shown, and the progress is very satisfactory as Secretary Cooper said. We are confident that we can meet the [deleted] 1990's IOC.

Dr. COOPER. For the benefit of Senator Thurmond and Senator Hart, I made the comment earlier that the ATB program is on the same schedule and will meet the same IOC that we briefed the subcommittee on last year and it remains fully funded.

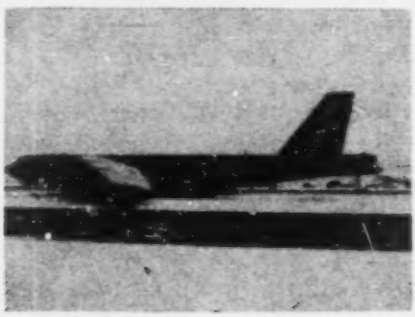
There has been some question about the Air Force commitment to ATB. I want to assure the subcommittee it remains on schedule for the IOC that we briefed you on last year.

Senator HART. Let me ask one question.

Does the subcommittee have or does the staff have your procurement plans for the life of that bomber?

Dr. COOPER. Yes, they do. We normally have a session each year just on our special access program.

B-52 SQUADRONS



- STRATEGIC MULTIROLE BOMBER
- BACKBONE OF AIR BREATHING LEG OF TRIAD
- USED AS LOW ALTITUDE PENETRATOR, CRUISE MISSILE PLATFORM AND CONVENTIONAL MUNITIONS CARRIER
- FY86: ENHANCE EXISTING SOFTWARE, ACCOMPLISH A STUDY ON AVIONICS HARDENING, AND COMPLETE AUTOPILOT DEVELOPMENT

General WILLIAMS. I would like to move into the B–52 discussion which still constitutes the bulk of the bomber force. It is now the low altitude penetrator cruise missile platform and our conventional munitions carrier.

We are trying this year in our 1986 request to enhance existing software. More specifically, we are asking for $7.6 million here to enhance the software.

B-52 SQUADRONS

($ IN MILLIONS)

	FY 84 & PRIOR	FY 85	FY 86	FY 87	TO COMPLETE	TOTAL
RDT&E	466.0	22.2	16.0	19.9	CONTINUING	CONTINUING

FY 86
RDT&E REQUEST

$ 16.0

- SOFTWARE DEVELOPMENT 7.8
- AUTOPILOT UPGRADE 5.0
- HARDENING STUDY 3.4

SCHEDULE

- CONTINUING SOFTWARE DEVELOPMENT FY 88
- HARDENING STUDY COMPLETE FY 88
- AUTOPILOT DEVELOPMENT COMPLETE FY 88

On the advanced systems' air-launched cruise missiles software development, autopilot upgrade, we need some improvements there. The hardening study to ensure that advanced avionics are hardened against electro magnetic propagation and the connectors we think will permit us to upgrade that system.

I don't plan to dwell on the B-52. I would like to move on to the FB-111.

F-111 SQUADRONS

- MISSION ESSENTIAL RELIABILITY/MAINTAINABILITY AND SAFETY UPGRADES
- CRITICAL TO CONTINUED VIABILITY OF F/FB-111 FLEET
- FB-111 AVIONICS MODERNIZATION PROGRAM (AMP) EFFORTS ONGOING
- FY 88: BEGIN DIGITAL INFRARED DETECTION SYSTEM (DIDS) AND DIGITAL FLIGHT CONTROL SYSTEM (DFCS) DEVELOPMENTS

We do have 61 of these in the strategic forces. Most of these are in the tactical forces, but we do have 61 of those in five squadrons in the strategic forces.

This is the overall FB-111 upgrade.

F-111 SQUADRONS

($ IN MILLIONS)

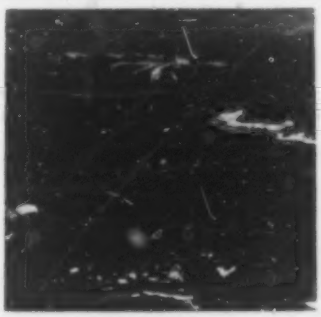
	FY 84	FY 85	FY 86	FY 87	FY 88 - FY 90	TOTAL
RDT&E	74.1	90.0	54.5	47.8	42.5	278.9
WPN SYS PROC	97.8	206.5	294.5	364.2	722.8	1675.8
QUANTITY BUY*	0	92	99	88	123	382
DELIVERIES*	0	0	0	104	278	382

*F/FB-111 AMP MOD KITS

FY 86 RDT&E REQUEST

$ 54.5

- AIS 27.3
- DFCS 10.9
- AMP 8.9
- PAVE TACK MOD 6.4



FY 86 WPN SYS PROC REQUEST

$ 294.5

- AMP 234.1
- PACER 30 29.2
- F/FB SIMULATOR 18.0
- ALE 40 3.2
- OTHERS 12.0

SCHEDULE

• DFCS FSD CONTRACT AWARD	FY 86
• DELIVER EF-111, F-111 A/E AIS	FY 86
• MOD CONTRACT AWARD	FY 86
• DELIVER AMP MODIFIED FB-111	DEC 86

But the strategic forces are a part of the overall upgrade or specifically the AIS which is the shop test equipment replacement including the advanced avionics to be upgraded.

We have a digital flight control system. We have had some flight control problems with it. This will resolve those. The avionics modernization program will improve the radar and improve the bomb-nav system on the FB–111 fleet from 2 hours to approximately 20 hours mean time between failure [MTBF].

That is important in terms of reliability and maintainability.

Moving now into the air-launched cruise missile capability of the B–52.

AIR LAUNCHED CRUISE MISSILE (ALCM AGM-86B)

- SMALL, ACCURATE, LONG RANGE, AIR-TO-GROUND MISSILE
- ENHANCES BOMBER LEG OF TRIAD
- PLACES MAXIMUM STRESS ON ENEMY DEFENSES
- FY86: CONTINUE TO DEPLOY AND PRODUCE ALCM COMMON SUPPORT EQUIPMENT FOR ADV CRUISE MISSILE AND B-1B PROGRAMS

This is the cruise missile that has been deployed since 1982. We had initial operating capability in the latter part of 1982 at Griffiss Air Force Base in New York.

Since then we have placed them in five squadrons.

AIR LAUNCHED CRUISE MISSILE (ALCM AGM-86B)

($ IN MILLIONS)

	FY 84 & PRIOR	FY 85	FY 86	FY 87	TO COMPLETE	TOTAL
RDT&E	1142.3	25.0	14.2	15.1	3.8	1200.4
WPN SYS PROC	2538.8	72.9	34.4	21.9	9.5	2675.5
QUANTITY BUY	1763	0	0	0	0	1763
DELIVERIES	1468	247	20	8	0	1763

FY 86
RDT&E REQUEST
$ 14.2

- MISSION PLAN 4.5
- DEPOT DEV 3.9
- AIR VEHICLE 3.8
- OTHER 2.0

FY 86
WPN SYS
PROC REQUEST
$ 34.4

- SUPPORT EQUIP 34.4

SCHEDULE

- IOC DEC 82
- LAST DELIVERY OCT 86

We are continuing to place them in the field. We have four more squadrons to go. We are still looking for support equipment. That

is what these funding lines do, mission planning, depot development and the vehicle itself.

We are continuing to field this. The effort now is not to procure the missile. We have bought those. We are looking for continued support necessary to field the remaining four squadrons.

Senator WILSON. What is involved in that?

General WILLIAMS. For instance, every 30 months we have to remove the engines and return them to the depot for overhaul. We have to have equipment to do that. We don't have it at the bases. That is the bulk of the cost. We have the W-80 warhead that goes back for normal routine maintenance.

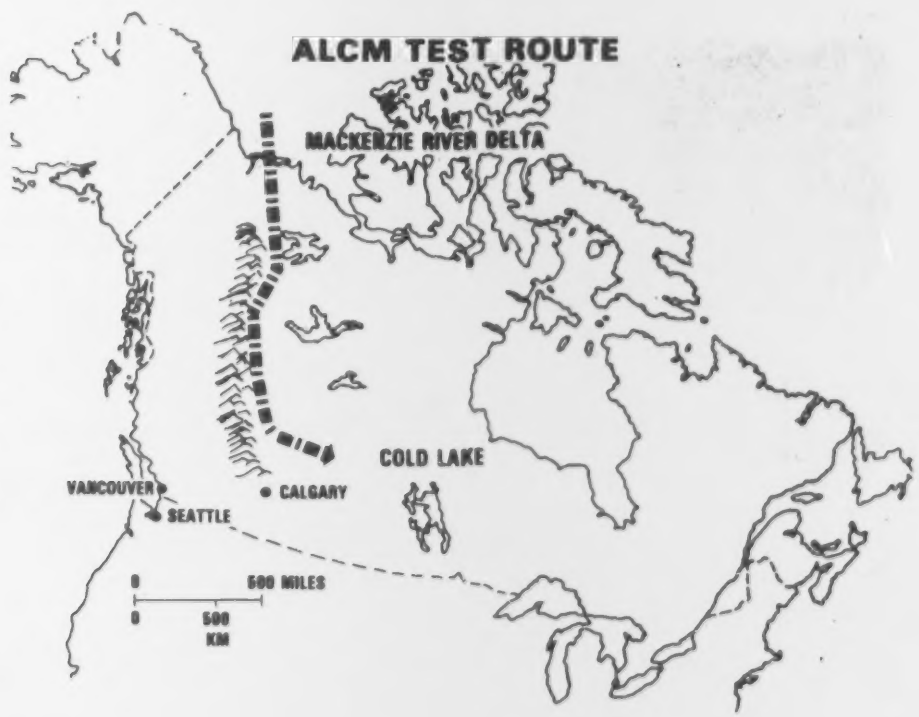
The equipment to support that operation, both in the depot and the new bases is what is involved. The bases that are receiving this do not have that equipment. So, the purchase of that equipment for the first time constitutes the bulk of the funding.

Dr. COOPER. You might recall in 1984 when we made the decision to go for the advanced cruise missile, we proposed to buy a large increment of AGM-863. We did not request procurement funds for the missile last year or this year.

We are now moving into the final stages of development and starting to initiate procurement of the advanced cruise missile.

General RUSS. I might say about the support equipment, that two of the major pieces we are buying this year are the radar altimeter test sets and some loading frames. Those are both common to the advanced cruise missile and the B-1B.

So, it is not strictly for the ALCM, but it will allow us to use the other missile when it comes in.



General WILLIAMS. You may recall some publicity on the Canadian air-launched cruise missile test flight. We have fired two arching up over the Arctic Circle, a 1,400-mile flight launched at 35,000 feet.

The missiles descended to around 400 feet above terrain, depending on the roughness of the terrain, and flew approximately 3 hours 45 minutes to a target northeast of Calgary here and then climbed to 10,000 feet and deployed a parachute. They picked it up from there.

The interesting part of this is that it flew without any significant bubble [deleted].

The design range for this is 1,500 nautical miles range. We are pleased with that.

Senator WILSON. That is an interesting slide. It provokes a question.

What happened in terms of our radar?

General WILLIAMS. You mean radar warning system picking that up?

I can't comment for air defense officially, but in general all low-flying aircraft have an advantage in avoiding missile radars. We have test programs looking to the future, such as over-the-horizon radar [OTH], that will help us redress this deficiency.

This has a small radar cross section. You have seen it. You know it is not very large. It is low altitude and presents a challenge.

Dr. COOPER. I might ask General Shaud to comment further.

STATEMENT OF MAJ. GEN. JOHN A. SHAUD, U.S. AIR FORCE, DIRECTOR OF PLANS, DEPUTY CHIEF OF STAFF, PLANS AND OPERATIONS

General SHAUD. On this testing program we have it supported by the AWACS [deleted].

General RUSS. As we put in new radars in the DEW line, they combined with the AWACS will be able to pick up an aircraft or a missile of this size. We use AWACS for safety purposes on this track in order to make sure that other airplanes don't get within the vicinity of the ALCM and happen to run into it so we are able to pick it up.

I will say that the cruise missile threat is a difficult one and while the radar cross section of this cruise missile is small, we would not have the same ability to pick up one like the ACM which is our advanced cruise missile.

Dr. COOPER. I might add I think this program has been a tremendous success when you look at the accuracies we have achieved.

We had a goal of [deleted] I think we are right around [deleted]. It has really met all the specifications.

From a technological point of view, it is a wonder.

Senator HART. How about the range requirement?

Dr. COOPER. It met those, Senator, the propulsion range of [deleted] and we have slightly exceeded that.

Operational range, when you take into account the deviations, [deleted] and we met that.

General SHAUD. I might mention it was the offices of the Canadian Government that permitted that testing for the low range. It is quite useful. We feel more and more confident about this missile.

It was also launched by operational crews out of Grand Forks.

Senator THURMOND. How long does it take from the time it is launched until it reaches its maximum speed?

General WILLIAMS. From time of launch, I would guess about 3 minutes, but I would want to check that to be sure. In this case, in fact in most cases it will continue to descend down to lower altitude.

General RUSS. Let me explain that a bit further.

It generally takes the speed of the airplane when it is initially launched. So, whatever speed the airplane is going, assuming the speed of the airplane is 0.7 mach, as soon as it drops off and opens its wings, the engine starts, it is almost up to speed right away.

The normal specification for the low altitude speed is [deleted].

Senator THURMOND. When it reaches its maximum speed, how fast is that?

General RUSS. [Deleted.]

Dr. COOPER. It does not rely on speed, Senator.

Senator THURMOND. What is the maximum range?

Dr. COOPER. The range is approximately [deleted] if it flew straight and level. That is about [deleted]. But if you program in flight deviations to avoid air defenses, we hope to have a range of about [deleted].

Senator THURMOND. How does that compare with the submarine launched missile?

Dr. COOPER. I believe, Senator, and I will correct this for the record—the ground-launched cruise missile is about [deleted].

General SHAUD. I think the characteristics are very similar.

Senator THURMOND. Now, you have the air-launched, submarine-launched and ground-launched?

Dr. COOPER. Yes.

Senator THURMOND. Is there any difference in the missile's configuration, range, speed, and so on?

General WILLIAMS. The air-launched cruise missile that we have is built by Boeing. The Tomahawk version which General Dynamics makes, the SLCM, the sea missile and ground-launched missile, they do have shorter range.

General RUSS. The sea-launched and ground-launched are in the same family made by the same people and they look basically the same. There are some minor differences because of the way the Navy operates and because of the salt water and a few other things. They have different characteristics.

Basically those two are the same. The difference, of course, is the ALCM which is air-launched. It is the first generation. The ALCM was built first and then the GLCM and the SLCM followed.

Senator THURMOND. Are there any advantages of the ALCM over the other two?

General RUSS. The ALCM is the only one that is qualified to drop off an airplane. The other ones have not been qualified to do that.

When we ran the competition to see what company would win the ground-launched version, we found that having commonality with the Navy, between the submarine-launched missile, sea-

launched cruise missile and ground-launched cruise missile was the best sort of arrangement.

Senator THURMOND. This could get off faster because it is in the air and we have an advantage in this respect?

General RUSS. Yes, sir. It does not require a boost to get going because it takes the velocity of the airplane.

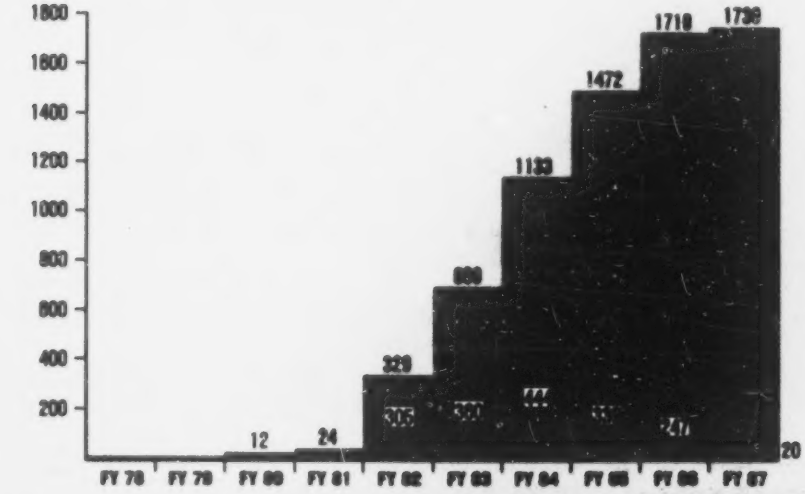
Senator THURMOND. This is already up there?

Dr. COOPER. That is one reason you have greater range for the air-launched cruise missile. The sea-launched cruise missile, while it can be used to attack ground targets, is also used to go against ships.

General WILLIAMS. Secretary Cooper mentioned our accuracy for 1983 to 1985. This shows a total of 18 shots in there were very close to hitting the target with a circle of error probability, which means 50 percent of them would hit [deleted] from the target.

These points were all plotted within [deleted]. The two I just showed you of the Canadian group that flew [deleted].

ALCM-B BUY/DELIVERY SCHEDULE



Senator HART. Is the payload classified?

General WILLIAMS. Yes, sir, it is, but we can talk about it. We can go from [deleted].

Senator HART. Is there direct correlation between the size of the payload and its range?

Dr. COOPER. [Deleted.]

General RUSS. It is like you [deleted].

Senator HART. You don't have to [deleted].

General RUSS. [Deleted.]

Senator WILSON. There is a little confusion. There have been numbers in terms of the range that are different versions of the cruise missile.

I understood you to say that now the air-launched has the greatest range.

Dr. COOPER. Yes, sir. I would like to clarify that for the record because I am going from memory on some of the others, but the air-launched cruise missile has an approximate [deleted].

The ground-launched cruise missile and sea-launched are in the vicinity of about [deleted].

If I am wrong, I will correct that for you, but that is my understanding.

Senator THURMOND. That is a big difference. I am surprised at that.

Dr. COOPER. Let us see if we can get a clarification.

Senator WILSON. We are talking about ground-launched missiles that we deploy with the Pershing II in order to provide a counter threat to the SS–20. If it has a maximum range of [deleted].

Dr. COOPER. I will check that. I don't have the range on the top of my head.

Senator WARNER. What about your colleagues?

General WILLIAMS. My understanding is the same. It is running around [deleted] for the cruise missile.

General SHAUD. We have a minority opinion here, but we will look it up.

Senator WILSON. I am just shaking my head in astonishment.

Dr. COOPER. We will clarify that, Senator.

General WILLIAMS. We have a short film clip if we can get it going here on the air-launched cruise missile. That weighs about 25,000 pounds, Pylon mounted on the outside with six cruise missiles. That is a pretty heavy piece of gear to move around.

It shows the aircraft launching it, ascending to altitude and flying with the terrain, the Tercom mapping. This is another shot of the test.

Senator Thurmond, you saw the wings immediately spanned to provide flying ability.

ADVANCED CRUISE MISSILE

I would like to move now into the advanced cruise missile. We have five squadrons of cruise missile carrying aircraft in the field. We have four more to be deployed. We are now moving toward production, toward a full-scale development of the advanced cruise missile.

This is the next generation. This is the first time we have been able to discuss that in closed testimony without special access. We are limited to the amount of information we can discuss, but we think it is prudent in the evolution of the program that we move the funding to this level of classification.

Looking at 1986, we are looking at weapon systems [deleted] continuing to invest in RDT&E with vehicle and aircraft integration to include the engine.

We had the FSD contract awarded in April 1983. We plan to have the first [deleted].

Senator HART. These replace the first generation or are supplemental?

Dr. COOPER. We are building [deleted] of the ALCM-Bs, as I call them vanilla flavored ALCMs, the earlier version, and about [deleted] of those.

General WILLIAMS. Dr. Cooper is just saying if we chose to buy the air-launched cruise missiles. We have bought that out now in 1984.

[Slide deleted.]

This shows the delivery to the field and we did reduce the concurrency in the advanced cruise missile and moved the buy to the right as shown on this chart.

We moved [deleted] of the ALCM to fiscal year 1984, switched to the advanced cruise missile, and then ramped up in this fashion for a total of [deleted]. We think that makes a nice movement there between the two programs.

We believe that the air-launched cruise missile should have a shelf life of somewhere between 15 and 20 years. We just aren't sure of that.

On many of these programs we have never done this before. We have fleet testing and we will continue to monitor the shelf life of the missile.

As I said, for the air-launched cruise missile we will remove the engine every 30 months and send it back for depot overhaul. That will give us data to advance conclusions in and to your question.

SHORT RANGE ATTACK MISSILE II (SRAM II)

- REPLACEMENT FOR AGING SHORT RANGE ATTACK MISSILE (SRAM)
- IMPROVES BOMBER OPERATIONAL CAPABILITY AND FLEXIBILITY AGAINST DEFENDED AND RELOCATABLE TARGETS
- SUPPRESSES DEFENSIVE THREAT. STRIKES DEFENDED TARGETS FROM OUTSIDE LETHAL DEFENSE ZONES
- FY 86: FSD CONTRACT AWARD

Now, I would like to talk about the short-range attack missile. That is SRAM II. That was the advanced air-to-surface missile you may recall from an earlier hearing.

This is to replace the short-range attack missile that was deployed in 1972. It was forecast to have a shelf life of 5 years. It has been in the field roughly 15 years.

We are starting to see problems with that. In our recent anti-satellite shot we did have an early stage burn-out because of some separation between the propellant and the sides of the SRAM.

We do feel that this is a prudent program and one that is necessary to replace the earlier SRAM in order to have that capability.

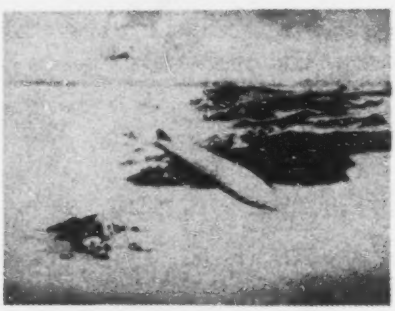
SHORT RANGE ATTACK MISSILE II (SRAM II)

($ IN MILLIONS)

	FY 84	FY 85	FY 86	FY 87	FY 88 - FY 90	TOTAL
RDT&E	6.5	25.0	79.0	208.1	708.0	1016.6

FY 86
RDT&E REQUEST
$ 79.0

- MISSILE, SOFTWARE, AND AIRCRAFT INTERFACE REQUIREMENTS



SCHEDULE

- STUDY CONTRACT AWARD — FEB 85
- FSD CONTRACT AWARD — MAY 86

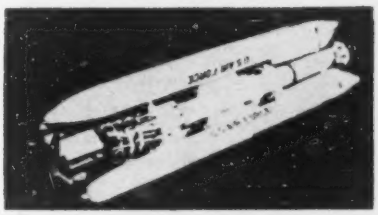
We are looking for $79 million in fiscal year 1986, to continue missile with aircraft interface requirements. We think the additional range that will be provided by this is roughly [deleted] will give us a stand-off capability for hardened targets and will give us improved accuracy.

This will give us a supersonic missile 2½ times the speed of sound and that makes it extremely difficult for the Soviets to defend against this.

The accuracy of the SRAM will be less than [deleted] feet. This depends largely on the platform, which in later years will be from the B–1B.

Moving now to the CSRL or the common strategic rotary launcher, what we have here is an attempt to reduce the number of launchers in the field that we are having to buy.

COMMON STRATEGIC ROTARY LAUNCHER (CSRL)



- MULTIPURPOSE MUNITIONS LAUNCHER
- CARRIES WIDE VARIETY OF EXISTING AND PROJECTED NUCLEAR AND CONVENTIONAL MUNITIONS
- PROVIDES INTERNAL CRUISE MISSILE CARRIAGE FOR EXISTING BOMBERS AND A FULL RANGE OF CARRIAGE OPTIONS FOR THE ADVANCED TECHNOLOGY BOMBER
- FY86: FLIGHT TESTING ON A B-52H

You mentioned earlier, Mr. Chairman, about the support equipment.

For each unique launcher that we buy we have to have special support equipment because these launchers become very complicated in themselves. Our effort is to reduce the level of that support equipment, being able to load with live ammunition from a strategic standpoint on a variety of platforms.

The common strategic rotary launcher has been our answer to that problem. It is a less expensive alternative. The life cycle costs are less if we go to this type of munitions rack.

For those who are not familiar with munitions carriers, we had the triple ejector rack that we put under the fuselage and we had to struggle to get that to work. I think this will be with the same type of support and simplicity and will represent cost savings in the out years for strategic munitions.

Senator WILSON. You said provide a variety of carriage in ATB. I assume that will be in the special session?

General WILLIAMS. Yes, sir.

I can't say much more about that today.

COMMON STRATEGIC ROTARY LAUNCHER (CSRL)

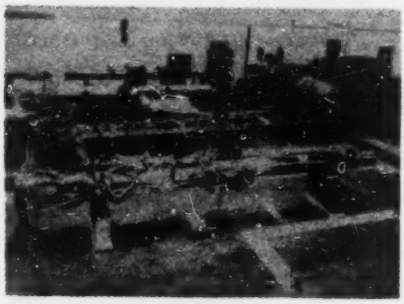
($ IN MILLIONS)

	FY 84 & PRIOR	FY 85	FY 86	FY 87	TO COMPLETE	TOTAL
RDT&E	148.7	86.3	72.6	24.5	0	315.1

FY 86
RDT&E REQUEST

$ 72.6

- LAUNCHER/B-52 INTEGRATION 34.1
- B-52 FLIGHT TEST 28.6
- ENGR CHANGE PROPOSALS 6.9
- OTHER GOVT COSTS 3.0



SCHEDULE

- SOURCE SELECTION JUN 83
- FSD CONTRACT AWARD JUN 83
- B-52 FLIGHT TEST AUG 85
- B-52H IOC FEB 90

In fiscal year 1986 we are looking for $72.6 million to continue integration and flight test. We will have $75 million in production costs. That is carried in the B–52 modification line to get this into production.

Source selection contract award was in June 1983. We are looking at flight test at this time. We hope to have it on the B–52H fleet in 1990.

I should mention also that one of the values of this type of approach is that we do plan to move from B–52 to B–1B. Again, looking at modular approach, two munitions carried.

Dr. COOPER. Senator Wilson, you and I had a discussion about what our plans were on CSRL.

To clarify that, we have funded it in 1986. We don't see it in CSRL because the aircraft itself buys its launcher, but there is $75 million in the B–52 line for modifications.

General WILLIAMS. Looking now to another aspect, the conventional role for the strategic bomber, long-range bomber, we do have commitments around the world as shown here.

The commanders in chief of the fighting forces depend on the long-range heavy payload responsive capability of long-range aircraft to move in a matter of hours from the continental United States to anyplace in the world.

STRATEGIC CONVENTIONAL STANDOFF CAPABILITY (SCSC)

- SELF CONTAINED CONVENTIONAL STANDOFF CAPABILITY FOR STRATEGIC BOMBERS
- INTEGRATES CONVENTIONAL STANDOFF WEAPONS AND DEVELOPS IMPROVED TARGETING SENSORS FOR STRATEGIC BOMBER
- CURRENT EMPHASIS ON NON-ALCM B-52s
- FY 86: FUND WEAPON INTEGRATION AND TARGETING SENSOR IMPROVEMENTS

The strategic conventional stand-off capability is a program designed to enhance that capability in the B–52's and possibly be transferred to the B–1B later.

STRATEGIC CONVENTIONAL STANDOFF CAPABILITY (SCSC)

($ IN MILLIONS)

	FY 84	FY 85	FY 86	FY 87	FY 88 - FY 90	TOTAL
RDT&E	23.6	24.0	71.8	53.7	33.6	208.9

FY 86
RDT&E REQUEST

$ 71.8

- HIGH RES RADAR 63.6
- ICSMS* 4.4
- HAVE DARK 3.8

SCHEDULE

- ICSMS* FLT TEST FY 88
- HAVE DARK FLT TEST FY 87

*INTEGRATED CONVENTIONAL STORES MGT SYS

We do have a high resolution radar demonstration. We are not buying it for fleetwide distribution. It is an RDT&E request. This is just a standard electronic bus on board that can handle a variety of munitions.

This is a classified program we will have to discuss in special access. We do look for flight tests in 1986 and 1987 for those programs respectively.

HARPOON

- AIR LAUNCHED ALL WEATHER ANTI-SHIP CRUISE MISSILE
- DEFEND SEA LINES OF COMMUNICATIONS
- DEPLOYED IN TWO B-52G SQUADRONS (IOC DEC 84); TOTAL BUY INCLUDES 85 MISSILES
- FY 86: SUPPORTS MISSILES PROCURED IN FY 85

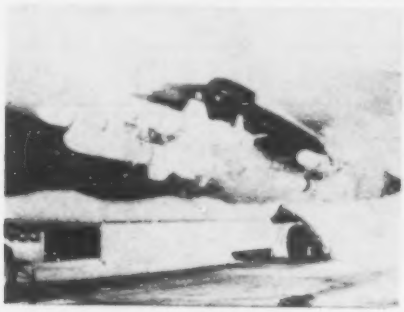
We have another success story we are pleased to talk about, the Harpoon antiship missile. We buy these missiles from the Navy. We are installing them on squadrons at Loring Air Force Base, ME, and at Andersen Air Force Base in Guam.

It is an all-weather antiship cruise missile with semi-active radar homing. We capitalize on the B-52's that are already deployed to place these munitions aboard them and then go with the range and payload capability, do surveillance across ocean in concert with the Navy and then be able to attack shipping in close coordination.

HARPOON

($ IN MILLIONS)

	FY 84	FY 85	FY 86	FY 87	FY 88 - FY 90	TOTAL
WPN SYS PROC	0	48.3	2.0	0.3	0.8	51.4
QUANTITY BUY	0	85	0	0	0	85
DELIVERIES	0	42	0	43	0	85



FY 86
WPN SYS
PROC REQUEST

$ 2.0

- SPARES 1.4
- MODIFICATIONS 0.6

SCHEDULE

- FINAL DELIVERY FY 87

We have bought 85 missiles already. We are now in the process of fielding them. Approximately half of them will go to Loring and half of them will go to Andersen in Guam.

We will have 15 aircraft at Loring that will be capable of carrying these. We have now 14 of them at Loring and we have 1 at Guam that is capable of carrying them.

We are continuing to modify those. We will have all 30 of them completed by this summer.

Mr. Chairman, this is not in deference to your previous role as Secretary of the Navy, but we think it is a success story. Our Navy friends are pleased with this.

This shows the launch of the Loring B–52 aircraft shown there loaded with three Harpoons. We can carry a total of 12 Harpoons externally on the B–52's.

Senator WARNER. What sort of mission profile would this be used in?

General WILLIAMS. We would anticipate having [deleted]. A B–52 at high altitude will locate the ships. That is assuming the Navy put us in and coordinated it.

The SRAM launches and then cruises about 450 knots.

Senator WARNER. You said SRAM. Do you mean Harpoon?

General WILLIAMS. The Harpoon. It gets down to around [deleted] above the water, finally gets down to about [deleted] feet in the final profile just before it moves in to hit the ship. It starts homing on the ship about [deleted] nautical miles from the ship.

In this case we didn't have a warhead aboard. We will show you another shot which shows where it hit the ship. It goes through it and comes out the other side.

We did launch by B–52's, two Harpoons that hit the ship. One Harpoon was ten feet ahead of the bow, but would have done damage if it had exploded.

We think it does demonstrate how we can take the munition and adapt it to the B–52 with its range and payload.

Senator THURMOND. That one that went right through, was that a weak place in the ship or was that an open space or did it go through all the steel and iron?

General WILLIAMS. I think we have to say it went through all that steel and iron. It had a 500-pound warhead. In this case it did not have a high explosive on it.

General RUSS. It would depend on what part of the ship is hit. The superstructure is less armored and it went through fairly easily. That wasn't a classic war ship we were attacking either.

Senator WARNER. You are going to have both nuclear and conventional warheads?

General RUSS. Just conventional. They are to augment the Navy. The concept is for us to have sufficient missiles in the wings so that we have initial capability and then the Navy would resupply us with Harpoons from their inventory wherever they wanted us to go.

Back on your previous question on how do we control it. The operational concept is still evolving and we could use another B–52 at altitude. We could use an E–3A. We could use an E–2 Hawkeye.

In the NATO environment we could possibly use Nimrod, whatever is available and tied into the Navy system to tell us where the ship is and where we need to go. That depends on what part of the world it is in.

Senator WARNER. What was the launch system attached to the aircraft? Anything in particular?

General WILLIAMS. No, sir. It was a modified MAV–12, Mr. Chairman.

General RUSS. We modified the airplanes approximately a year ago to be able to take the Harpoon. We wired the airplane. But the basic conventional capability of the B–52 will allow us to mount these on the airplane.

It was a modification of the B–52. I don't want to say it didn't cost anything, but it wasn't significant.

Senator HART. You launched at what range?

General RUSS. You can launch out to about [deleted], sir.

Senator HART. What is the homing technology?

General RUSS. It has a launch and leave capability which means it has its own individual radar seeker in the front end, that turns on after missile release. It then picks up the ship when it gets into the range.

Senator HART. It does have active radar?

Dr. COOPER. It has a semi-active radar for terminal guidance, but the Navy is looking for infrared imaging signal capability as well.

Senator HART. What is to prevent the Soviets from doing the same thing to our Aegis?

Technologically, is it the same problem for us?

Dr. COOPER. Yes, it is.

General RUSS. The ship that we shot at, to be fair to the Navy, didn't have anybody shooting back at us. Certainly the Navy has

radars and systems that will pick up these incoming missiles and intercept them.

Dr. COOPER. For every measure there is a countermeasure; we are continually playing the cat and mouse game.

Senator WARNER. The Bear and Bison would quickly adopt it?

Senator HART. And are.

Senator WARNER. Yes.

Senator HART. They will have the same capability.

Dr. COOPER. Let me see if I can clear up the confusion about the range of the thing.

The Harpoon is on the order of [deleted] nautical miles, relatively short range. The conventional antiship version of the sea-launched cruise missile is [deleted]. The nuclear version of the sea-launched cruise missile and our GLCM is on the order of [deleted].

I would like to further clarify that for the record. That is my understanding right now.

KC-135R MODERNIZATION

- IMPROVES SYSTEMS PERFORMANCE TO MATCH SOUND KC-135 AIRFRAME
- MORE POWERFUL, FUEL-EFFICIENT CFM-56 ENGINES INCREASE OFFLOAD CAPABILITY 50% OVER KC-135A
- REDUCES TANKER SHORTFALL AND IMPROVES RELIABILITY, MAINTAINABILITY, SUPPORTABILITY
- FY88: CONVERT THIRD BASE TO KC-135R

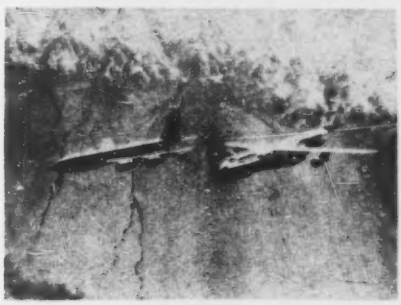
General WILLIAMS. I would like to shift from the attack version of the modernization of the air breathing leg to the KC–135 fleet which has become important.

You will probably note that all aircraft are built with aerial refueling. We deployed the last KC–135 tanker in the midsixties. So, the value of that fleet has increased as the number of aircraft wanting refueling has increased over the years.

KC-135R MODERNIZATION

($ IN MILLIONS)

	FY 84 & PRIOR	FY 85	FY 86	FY 87	TO COMPLETE	TOTAL
WPN SYS PROC	1184.7	786.3	837.7	971.4	4 173.2	7,752.3
QUANTITY BUY	88	43	43	88	194	356
DELIVERIES	2	29	31	35	254	356



FY 86
WPN SYS
PROC REQUEST
$ 837.7

- ENGINES 494.8
- AIRFRAME 288.4
- OTHER 32.7

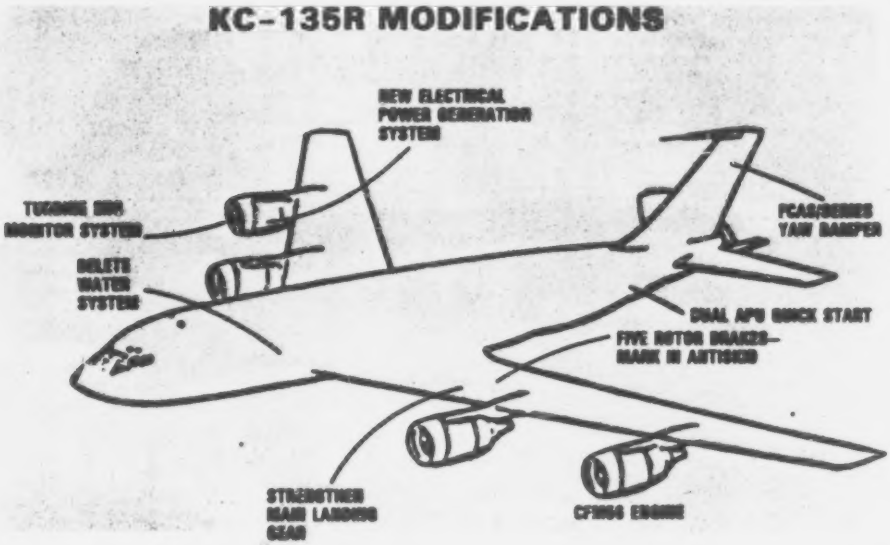
SCHEDULE

- PRODUCTION DECISION JUL 81
- FIRST MOD COMPLETE MAY 82
- IOC JUN 86

We are looking at the KC–135 modification. That places a CFM–56 engine aboard the KC–135 and I will describe that in a moment.

It does some other things to the aircraft. It gives us roughly one and a half times the refueling capability of the current tanker. We are looking in fiscal year 1986 for some more dollars to buy 43 ship sets. That means four engines for 43 KC–135's.

We will continue to have deliveries from previous year procurement. Look at this profile here through 1986. I think it is important to note that this program does more than just replace the engine. Replacing the engine is important, 25-, 30-year-old engines.



In addition to that, we do have dual auxiliary power units that give us an enhanced quick start capability. We have better brakes. We strengthen the landing gear. We get rid of the old water injection system. (We had a water injection system on the KC–135A to get the necessary thrust. That becomes very difficult in some parts of the world.)

We also place new electric generators on there. This has made our tanker fleet look to the future with a lot more promise and a lot more capability and with roughly $18 million we get a new tanker that will last us well into the next century. We think that is a pretty good investment.

Senator, this completes our prepared formal remarks.

I appreciate the opportunity to have a chance to talk to you.

Senator WARNER. We will now go to questions.

Senator Hart?

STEALTH (ATB)

Senator HART. Does the so-called Stealth technology extend to either generation of the air-launched cruise missile?

Dr. COOPER. Senator, without going into a lot of detail here, we have made public that the advanced cruise missile is based on the Stealth design.

Senator HART. We will hear more about that later.

Dr. COOPER. Yes.

Senator HART. Second, what is the official or unofficial Air Force position on requesting more than 100 B–1B's?

Dr. COOPER. As you know, both Mr. Weinberger and Mr. Orr have clearly stated we have no plans to buy additional B–1B bombers. Our program stops at 100.

FB-111

Senator HART. What are your plans for the FB-111, particularly with the full complement of B-1B's?

Dr. COOPER. Very briefly, and I will ask General Russ to comment more, as you know, we have 61 FB-111's and our highest priority effort on the FB-111 is to upgrade the avionics.

Right now we have a very poor mean time between failure record. This program is called the avionics modernization program. We want to do that immediately on the FB-111.

Eventually it is planned to transition those aircraft into the Tactical Air Forces.

General RUSS. The timing for transferring them to the Tactical Air Forces is in the early nineties. We have not decided exactly when that will be.

You fully appreciate the fact that we don't like to phase out strategic bombers without some quid pro quo, if you will, from the Soviets.

So, while we have negotiations ongoing, we are really not attempting to phase anything out yet. But the airplane is similar to the ones in the tactical forces and will help augment and maintain the TAC force level.

As a matter of fact, the level in the TAC forces is continuing to decrease through attrition. Each year we lose two or three airplanes. So, if we move the strategic FB-111's to the TAC forces, we will about maintain the same level, the same original level of 111's in the TAC forces.

As I say, we are looking in the early nineties to do that.

Senator HART. Several years ago, before your watch, Senator Goldwater and I looked at the strategic warning system and the inadequacies thereof. At that time the committee recommended very strongly that there be a massive replacement of the computer capability.

Are you prepared to tell us where that stands right now?

NORAD

Dr. COOPER. Are you talking about the North American Air Defense Command?

Senator HART. Primarily.

Dr. COOPER. The entire system was built in the late seventies. We are dealing with computer systems which are two generations old.

I do remember the problems. I was on this side of the river when we had the false alarms out at NORAD.

One of my colleagues here might be able to comment on that.

General SHAUD. Senator, in the North American Air Defense Master Plan we addressed many facets of that. Interestingly enough, recently we were working on an agreement on the northern warning system with the Canadian Government, long-range and short-range radars, delivering the OTH-B's.

We have new regional operational control centers in position modernizing our fighter fleet. The computer hardware within the mountain, it is my understanding, has been upgraded to a certain extent, but I don't have further details on it.

Senator HART. Could you provide that to us?

One of the responses we got out there was the long procurement time for computer technology that was driven by Air Force and DOD regulations. By the time you went through all the hoops and ordered from Honeywell or somebody, and they prepared and got it to you, there was already another generation that was better.

What we did, was put language that permitted you to jump over a lot of these hoops.

General RUSS. Yes, sir, we took advantage of that.

What I would like to do is provide you a rundown for that and explain to you exactly what we did fix and the timetables, when we put in the new computers and changed the software, and so forth.

Dr. COOPER. I don't think that is a one-time fix. I think we have addressed the concerns that you and Senator Goldwater have raised as a result of your investigation.

We are continuing to modernize that capability.

Senator HART. That is the right answer. If there is any way I am prepared as one member of the Senate to spend money, it is there.

We can't afford to cut corners on that.

Dr. COOPER. I think over the last several years we have done a very good job in terms of addressing the whole warning system, our entire warning system. We are upgrading North Warning, updating the DEW line and Pave Paws will be installed at 4 sites. We are also upgrading the BMEWS.

Senator HART. That is terrific so long as the $1.79 chip manufactured in Korea doesn't malfunction.

CRUISE MISSILES ON B–1B

Senator WARNER. What are the current plans, gentlemen, for testing and deployment of cruise missile capability on the B–1Bs?

Dr. COOPER. Again, I will respond briefly and turn it over to General Williams.

As you know, our original platform for testing was B–1 aircraft No. 2, the one that we lost in the crash. [Deleted.]

As far as the specifics of that, I will allow General Williams to talk to that.

General WILLIAMS. [Deleted.] The software issue I think we have addressed in that we will test it, we will have the external and internal carriage developed in terms of capability testing.

But then for the production models of the B–1B we will place skin, external skin, over the attachment for the cruise missile and we will also not have the total wiring capability installed. We believe this will satisfy the requirement as well as take advantage of the fact that we have a test team together and the testing facilities oriented to the B–1B before we complete that phase of the testing.

I should add that flight testing for new munitions on one of these platforms is expensive. So, we are trying to optimize our investment. We think that will work out.

General RUSS. May I add a comment to that?

[Deleted.]

Senator WARNER. Will you have to retrofit?

General RUSS. Yes, sir, but it is not a significant sort of thing. We were aware of what we were going to do as we got along, we

just didn't make the decision soon enough to put it in the first few airplanes.

Senator WARNER. Will that modification enable you to take either the ACM or the ALCM?

General RUSS. Yes, we will be able to take either the ACM or the ALCM externally in the inventory.

Senator WARNER. What are the arms control implications in such planes?

General SHAUD. Sir, I can talk to that briefly.

We certainly don't want to claim that the B-1 is an ALCM heavy bomber until it is operationally put on the ramp as an ALCM heavy bomber. In fact, we are addressing the policy question right now, the Joint Chiefs, and so forth, to make sure that our ALCM testing does not give us a problem in the treaty arena.

Senator WARNER. If the SALT II limits are extended, what are the trade-offs for ALCM counting as additional MIRV countable launchers within the——

General SHAUD. As you know, any subset of the [deleted] end up being possible trade-offs ranging from the submarines through the Mirved missiles to the ALCM heavy bombers.

Senator WARNER. To what extent do the modifications in the way of plans for the B-52 enhance performance as opposed to reliability and maintainability? How are these performance improvements related to the role?

Why don't you answer that for the record.

I am going to try to go to the floor and speak on behalf of our colleague, Senator Tower, whose nomination is now pending as one of the three arms control representatives.

I want to close out with a couple of quick questions here and then I will ask Senator Wilson once again to assume the chair.

On the trivia side, B-1B at the Paris Air Show. If not, why not?

Do you want to answer that for the record, Mr. Cooper?

Dr. COOPER. The second part I will answer for the record. The first part is, to my knowledge, we have no plans to take the B-1B to the Paris Air Show.

[The information follows:]

B-1B AT THE PARIS AIR SHOW

The 1985 Paris Air Show will take place between 30 May and 9 June. At that time, only two B-1Bs will have been delivered to the Air Force. B-1B number 1 is the primary test article, now undergoing initial flutter, stability and control, and performance testing at Edwards AFB. It is essential that the test program clear a safe operational envelope before B-1B number 2 is delivered to the Strategic Air Command (SAC) in late June. Sending B-1B number 1 to Paris would preclude this important activity and delay site activation at Dyess AFB. During the May-June time period, B-1B number 2 will be involved in an intensive ground test effort to verify critical technical orders and train SAC maintenance technicians. Without this verification of maintenance technical orders, SAC will be unable to conduct routine flight operations. Sending B-1B number 2 to Paris would delay site activation at Dyess AFB.

Senator WARNER. I was present at Farnsborough when the B-1 was exhibited. It seems to me with the investment and the pride in that aircraft, that ought to be taken into consideration. Maybe you and I can establish a liaison on that, Dr. Cooper.

Dr. COOPER. I think the short answer to the question "why not" is right now we are in the test program with the only asset that we have.

Senator WARNER. You don't want to dump one?

Dr. COOPER. To take it out for any significant period of time could have an impact on the test program.

Senator WARNER. One last question. Again, this goes to World War II when I was in the Naval Cadet Program a lot of guys were proud of the fact during training they may have wrapped up one or more aircraft before they got their wings.

How do you propose to train pilots to fly this B-1B?

I presume you will take them with a number of hours.

PILOT TRAINING FOR B-1B

General RUSS. The initial cadre of pilots will have a number of hours. I have gone out and flown the airplane myself; it is not a difficult airplane to fly. In fact, it is a lot easier to fly than the B-52.

Senator WARNER. You certainly don't have the inventory to have many operational problems.

General RUSS. No, sir, you don't. With side-by-side seating and with the copilot and a position for an instructor pilot there, I think it will be very capable.

We are also buying some simulators, as you know, that will allow us to do significant pre-training before they get in the airplane.

Senator WARNER. One last point.

Secretary Cooper, will you provide the subcommittee with a detailed breakdown of the unit flyaway cost of the B-1B?

Dr. COOPER. We have that, Senator. I will do that for the record.

[The information follows:]

B-1B FLYAWAY UNIT COSTS

The fiscal year 1986 President's Budget requests authorization to procure 48 B-1Bs. The unit total recurring flyaway cost for this buy is $136.8M (TY) per aircraft. The unit gross total flyaway, which includes non-recurring costs, is $144.7M (TY) per aircraft.

For the 100 aircraft baseline program, the unit total recurring flyaway cost if $171.7M (TY) per aircraft. The unit gross total flyaway is $212.2M (TY) per aircraft.

Senator WARNER. Total program divided by 100, what does it come to?

Dr. COOPER. If we meet the $20.5 billion, it is $205 million a copy.

B-1 AND ATB

Senator WILSON. Let me ask you a couple of questions about the B-1 and the ATB respectively.

This really has to do with the funding. At least one reason advanced in 1981 for having a 100 B-1 bomber force was as a technological hedge against the ATB.

Without getting into any classified material, can you simply respond to a question, does that reason still hold?

Does that requirement still exist? Is there a rationale for a similar hedging at this time?

Dr. COOPER. From what we see in the ATB right now, from a technological point of view, we see no show stoppers. That is not to say 3 or 4 years from now we will not have a problem.

I think the fundamental problem with the B–1 and ATB is that they are spaced in time by a considerable amount. I can't get into that in any detail here, but we advised early 1990's for the ATB IOC.

Even if you were to continue the B–1 for 1 or 2 more years, at some point, you have to call a stop. So they are not spaced in the same time frame where you can continue competition and continue that technical safety net throughout without continuing the B–1 production up until the time that you actually field an ATB.

From what we see right now, we have some competitive leverage with the contractor of the ATB. Certainly we would have more if we had two production lines hot throughout.

Again we see no show stoppers. It would be nice to have a little more competition. When we look at the dollars involved, and we look at our program and priorities, we don't think we can afford that right now.

Senator WILSON. I am sensitive to the point you make. On the other hand, I take it that what you are telling me is that you see no problems with the ATB in terms of its schedule, the funding is on track with the production schedule and proceeding at the pace that you expected?

Dr. COOPER. Yes, sir.

Senator WILSON. Now, the point you just made is one that I think is a significant one. Obviously, you don't need any lectures on it. You probably could give a few this morning in another hearing.

The Assistant Secretary of the Navy in terms of their shipbuilding is making much of the value of competition. It serves the Navy in terms of encouraging not only a cost competition, but encourages different yards to modernize and improve their technology and he cited all kinds of advantages from competition with which I agree.

I was having the same discussion earlier with Secretary Orr. It seems to me there was a difference between the response he made in testimony on the February 7 and the response to a question before this subcommittee.

I asked him a question about the ATB cost estimates and competition. On the one hand, he asserted that the technical and cost uncertainties of ATB had been fully resolved and that a B–1 hedge of the kind we have just been discussing is really no longer warranted.

Yet when I asked him specifically whether or not he had the same kind of pricing agreement with the contractor in case of the ATB that he had with Rockwell, he said no, it wasn't feasible to discuss such a thing because there had been not even a prototype built and he had no idea what the construction cost would be.

Dr. COOPER. Senator, I am familiar with that statement. Let me clarify.

When you talk about technical risk and you state there are no technical show stoppers in the program, by that we mean we think we know the fundamental technologies that go into that.

If there is risk in the program, it is engineering type risk, building it on schedule and within cost. From the point of technical problems, we see no technical show stoppers. We are confident we have the technology. But we have not built it yet.

We have a number of years in flight testing before we start producing it in numbers. That is where the risk is. I don't think we need a safety net for technical show stoppers at this point.

That is not any different from any of the programs we have where we don't have two guys going head to head in full-scale development. We are comfortable now that we have come to grips with the Stealth technology.

I think what Secretary Orr is saying is that we have measured all priorities we have in the Air Force. We don't think we can afford to carry the B–1 just as a safety net, or for that matter as competition, because the cost over the next few years will be too large to do that.

Senator WILSON. Senator Levin?

ATB

Senator LEVIN. A couple questions on the ATB.

Dr. COOPER, would you oppose vigorously any additional buy of B–1's beyond 100?

Dr. COOPER. Do we oppose any additional B–1's? Yes.

Senator LEVIN. How vigorously would you do that?

Dr. COOPER. I would do it very vigorously.

General RUSS. I will oppose it because our position is 100 B–1's. That is the budget we submitted. That is the President's budget and we fully support it. We have no money in the 1986 budget for any more than 100 B–1's. We made no effort to add any more money in out-years.

Senator LEVIN. You have estimated that the B–1 buy in 1986 would be $5,600,000,000. Am I reading that right?

Dr. COOPER. That is correct; $5.6 billion for production of the final 48.

Senator LEVIN. Is that a conservative estimate of what the contract will cost?

Dr. COOPER. That is an estimate that keeps us within the $20.5 billion program. It includes the actual cost that goes to the contractor plus the funds that are needed to run our program office.

Senator LEVIN. Do you feel that is a conservative estimate?

Dr. COOPER. Yes, sir. I will give you my personal opinion. I feel that is a conservative estimate. We will have a better feeling for that when General Thurman completes the negotiation on the last contract.

Senator LEVIN. When will that be?

Dr. COOPER. We anticipate probably about May.

Senator LEVIN. After we have the budget?

Dr. COOPER. It could be.

Senator LEVIN. Will you let us know as soon as that is done?

Dr. COOPER. In fact, as you may recall, your report last year requested that we do that. We certainly will.

Senator LEVIN. You indicated a $20.5 billion baseline cost, I believe, for the B–1B.

Is that still going to hold?

Dr. COOPER. Yes, sir, we believe so.

Senator LEVIN. There was a little change in the estimate of the modernization program savings. The Air Force technology modernization program was supposed to save $800 million. It ended up saving instead $500 million.

Is that familiar to anybody?

General RUSS. Yes, sir. I don't recall the exact figures, but I think the difference was down to about $150 million, if I am not mistaken.

Senator LEVIN. Will that difference be added to the baseline of the B-1?

General RUSS. No, it won't because there are other areas where savings have occurred.

Senator LEVIN. So, there have been savings that have been in unexpected places as well as additional cost?

General RUSS. There have been some pluses and some minuses in the program.

Senator LEVIN. Can you give us for the record all the pluses and minuses?

General RUSS. We will as soon as we get the final negotiation. They are in the final negotiation now. We will have that within a couple months.

Senator LEVIN. Can you give us for the record now the pluses and minuses that are known at this point?

General RUSS. Yes, sir.

[The information follows:]

PLUSES AND MINUSES TO THE B-1B PROGRAM

Unlike multiyear savings, projected Technology Modernization (Tech Mod) savings are not explicitly anticipated in the B-1B's $20.5B (fiscal year 1981) Presidentially certified baseline. Therefore, downward revisions in projected Tech Mod savings to the B-1B program, though disappointing, do not imply a breach in the $20.5B baseline cost ceiling.

The current program estimate continues to indicate that we will successfully stay within the $20.5B baseline cost. However, the allocation of costs among lower level cost categories has not been static. As the program has matured, negotiated contracts and actual performance data have replaced preliminary, unnegotiated proposals as the basis for estimating. In certain categories, our initial estimates were overstated. In others, our estimates were optimistic. This redistribution of program funds from one cost category to another as estimates are refined is normal and represents sound program management. These pluses and minuses are reflected in the table below which shows changes in program cost categories since 1981.

The B-1B's current baseline cost of $28.2B (TY) anticipates that almost $1.2B (TY) will be saved through implementation of a multiyear contracting approach. Based on last year's award of a multiyear procurement contract to General Electric, we are on track to achieving that total cost avoidance. We fully intend to comply with Congressional direction to provide, a full accounting of B-1B costs after the three remaining B-1B multiyear contracts are awarded.

B-1B FUNDING

[Fiscal year 1981 dollars, in billions]

Cost category	Development estimate (December 1981)	Current estimate (fiscal year 1986 PB)
Air frame	10.3	9.147
Engine	1.8	1.318

B–1B FUNDING—Continued

[Fiscal year 1981 dollars, in billions]

Cost category	Development estimate (December 1981)	Current estimate (fiscal year 1986 PB)
Avionics	3.0	3.452
ECO	.9	.384
Nonrecurring production	2.2	3.168
Support equipment	1.8	1.566
Other program costs	.2	.191
Initial spares	1.1	1.009
Multi-year procurement	(.8)	NSP
"Baseline" total	20.500	20.235

Note.—NSP–Not separately priced.

FUTURE BOMBER FORCE STRUCTURE

Senator LEVIN. Last year you promised the House Appropriations Committee, I believe, an overall plan on a future bomber force structure. I think you called it a bomber road map that is under review.

I am wondering whether or not we are going to be given that road map one of these days?

General RUSS. The bomber road map was discussed to some extent during our briefing here earlier. But not to the extent I think that some in the House Appropriations Committee would like. They would like exact phaseout dates of airplanes. However, we really are not prepared to do that.

As you fully understand, with the arms control negotiations starting, we are not willing to indicate when and where airplanes will phase out and in what quantities, and so forth.

We want to leave that a little bit fuzzy. We are going to establish certain levels of bombers. We are going to modernize with the B–1B and the ATB.

Other than that, we will show you the general trend. Once we get into the 1990 time frame, and that is critical because that is when the ATB comes in, between now and 1990 it is very cut and dried.

We have just so many B–52's and we are not buying any more and we are buying 100 B–1's. That is fairly easy to look at. It is after that timeframe that it becomes difficult.

Senator LEVIN. Do I understand as much of a road map as you can provide at this time has already been provided?

General RUSS. Yes, sir.

Senator LEVIN. Do we also have it, this subcommittee?

General RUSS. Yes, sir, you do.

Senator LEVIN. You have submitted that to us as well as to the House?

Dr. COOPER. We had a slide earlier, Senator, showing you what our force structure looks like 5 years into the future.

General RUSS. I think that took it out to 1990.

Senator LEVIN. That was the road map that you promised, that slide presentation?

Dr. COOPER. I guess that is about as much of a road map as we can put together now given the arms control negotiations.

Senator LEVIN. Do you have that in hard copy?

Dr. COOPER. Yes, sir, it will be in the record.

SDI

Senator LEVIN. A couple of questions on SDI and I will be done.

General Gabriel indicated that we are working on countermeasures to a Soviet SDI.

Dr. Cooper, can you identify where those countermeasures are being worked on?

Dr. COOPER. Which program?

Senator LEVIN. Soviet SDI.

Dr. COOPER. Yes, sir, in the advanced strategic missile systems programs, ASMS as we call it, where we are doing work on penetration aids to include chaff. We are also looking at the basic technology for maneuvering reentry vehicles.

Senator LEVIN. Is that in the same budget?

Dr. COOPER. Yes, sir, it is.

Senator LEVIN. What is the total amount in that budget for countermeasures to Soviet SDI?

Dr. COOPER. I will take that for the record and supply that.

[The information follows:]

COUNTERMEASURES TO A SOVIET SDI

The Advanced Strategic Missile Systems (ASMS) program is developing and demonstrating technologies for ballistic missile penetration options. These efforts are focused on providing options to counter defenses that the Soviets are currently testing or deploying. The ASMS penetration program's objective is to maintain the technology base and advanced development necessary to preserve a readiness posture for a reasonable number of options responsive to the projected threat.

Primarily, ASMS is focusing on reentry vehicle (RV) decoys (active and passive candidates), advanced radar chaff, defense suppression concepts, maneuvering reentry vehicle (MaRV) technologies that allow the RV to out maneuver (evade) defensive interceptors, and penetration aid concepts to [deleted] elements of a ballistic missile defense. In the fiscal year 1986 ASMS budget, we are planning $160M for the above efforts.

Senator LEVIN. Thank you.

Senator WILSON. Senator Exon?

Senator EXON. Thank you, Mr. Chairman.

Gentlemen, welcome. I have just a few questions. I think they are very simple to answer.

PAVE MINT PROGRAM

A year ago at the request of the Air Force, and particularly at the urging of Gen. Bennie Davis, this subcommittee authorized some funding for the Pave Mint program. Is that program now moving along in an expeditious fashion and what is its status?

General RUSS. The Pave Mint program, as you know, is to upgrade the ECM capability on the B-52. It is proceeding. It is doing quite well.

We have a lot of our B-52G's already modified. We are going to continue with our B-52 with an enhanced version.

General WILLIAMS. The Pave Mint program is the 117 program which will be going on our B-52G. [Deleted] which will be taken

care of in the 117 plus capability referred to as the ALQ-172 which will go on the B-52H.

To answer your question, that program is funded. It is in the modification program which we have provided for the record and it is moving along.

Senator EXON. Is there additional money in next year's budget for the continuation of this program?

General WILLIAMS Yes, sir, there is.

Senator EXON. In what year do you plan to complete it?

General WILLIAMS. We will complete Pave Mint procurement essentially in fiscal year 1988.

Senator EXON. Excuse me. What timeframe?

General WILLIAMS. In fiscal year 1988 we have $96 million for procurement. It drops rapidly after that down to $1 million. We will have completed it essentially in fiscal year 1988.

Senator EXON. Thank you.

Dr. COOPER. That is when the dollars are complete.

Senator EXON. Everything that you think is necessary in that program is moving along pretty much on schedule?

Dr. COOPER. Yes.

B-52 LOW LEVEL TRAINING AREA CLOSED

Senator EXON. Last year you closed down the low level B-52 training area in Nebraska. The subcommittee didn't take objection to that, although there was some concern in Nebraska about it. This subcommittee felt that the case the Air Force made for the potential difficulty with that range in regard to its restricted flight pattern was justified.

Has the training at the remaining ranges increased or are we significantly cutting back the training of crews for low level operations?

General SHAUD. Sir, the focus of our low level training right now is on the SAC strategic training range that we have invested in. It is basically in the Wyoming area, hopefully outside of populated areas.

We get very few environmental reports on low flying aircraft.

Senator EXON. They are pretty noisy aircraft.

General SHAUD. Right. I think in fact our training has improved. The amount of low level time that our bomber crews are getting has in fact increased slightly

Also we are using Red Flag, the range in Nevada, particularly for our conventional bomber crews. I don't believe our training was impacted significantly, sir.

Senator EXON. Are we conducting practice scrambling with the B-52 aircraft as frequently as we did in the past?

General SHAUD. To the best of my knowledge, the practice alert rate within the Strategic Air Command is about the same as it has been over the last several years. I know of no change.

General WILLIAMS. Senator, there is engine quick start capability where we can put a cartridge in each engine and that significantly improves it over what it has been. That has been installed now for several years.

Senator EXON. Have we increased the rate of practice or exercise scrambles, sending more of those flights aloft and getting them back or have we kind of leveled off on that program?

General SHAUD. As you know, quick start has been the key to surviving bombers since the fifties. The level of training that we have maintained on receiving a practice scramble from SAC, getting the crew to the aircraft, going through the procedures necessary for launch, I think has remained fairly constant and at a fairly high level over the last several years.

Senator EXON. Good. If there is any other information you would like to provide for us on the record, it would be helpful.

I was requested by staff to ask one question here for the record.

SRAM II

If we require the SRAM II to replace the aging SRAM and we do not intend to stress technology limits, why can't you produce a new batch of SRAM's using existing nuclear warheads and save the taxpayers the cost of developing a new system for a quarter of a billion dollars over the next 2 years?

General RUSS. Let me answer part of that and then I will ask General Williams to comment.

First, one of the problems with the SRAM I is the rocket motor. We have problems with that motor aging.

To be perfectly frank, we don't know how to make another motor just like that. We have tried to do it. We had a competition which was the longer life motor modification [L^2M^2] program.

Senator EXON. What is the math in lay terms?

General RUSS. After the motor is in there so long, it tends to crack and tends to deteriorate. It is only good for so many years. That is one of the problems we would have to design and develop new propellant.

Dr. COOPER. We might mention we have already exceeded what we thought was going to be the expected lifetime on SRAM I. We don't see catastrophic problems at this point.

At some point we know we will have a problem.

General RUSS. You have what you call a haystack burner. In other words, the propellant does not burn smoothly, so you don't get a constant acceleration. You get the burning faster in the first part and then slower, so the missile tends to go faster and then all of a sudden slows down. That gives you problems in accuracy.

When you have a solid propellant, once it starts, you can't control it as you can a liquid. Another problem is the warhead. It is not that it is unsafe. It is just that we know how to make warheads much safer.

We now put insensitive high explosive around it rather than the old material. It does not appear prudent to build a new missile with the old state of the art warhead that is not as safe as we now know how to make them.

General WILLIAMS. To continue, the SRAM was first deployed in 1972 with an initial shelf life of 5 years anticipated. If we do get the program we are asking for, SRAM II without stressing technology, that gives us high confidence we will get what we need with low risk, on schedule, within cost. It will be 1992.

The SRAM that we have now initially designed and fielded in 1972 for 5-year shelf life will be 20 years old before we can replace it even if we do what we want.

That is the reason we think the program we have developed is about right to do what we need and gives us confidence for that capability as soon as we can get it.

Dr. COOPER. One final comment about taking off-the-shelf technology. That is not to imply we are going to use the same technology that was in the 1972 SRAM.

We are going to take the technology we have available today which is probably 13 years more mature than the technology we had then.

Senator EXON. Thank you.

One last question, Mr. Chairman.

SOVIET FIGHTER AIRCRAFT

As we know, not all of the Soviet fighter aircraft have a look down/shoot down capability against low flying bombers or cruise missile.

In your intelligence sources, what percentage of the current Soviet aircraft have the capability to not only locate, but also track low flying bombers or cruise missiles?

General RUSS. Let me comment on that first and then I will ask General Williams if he can fill in.

All of the airplanes that the Soviet Union are producing today, the new fighter aircraft, have look down/shoot down capability and they are producing around [deleted] a year.

So, if you look at a 1990 timeframe, I would estimate some [deleted] will be look down/shoot down capable.

I may be a little off on that, but I will correct it for the record. It is important to note at that production rate by the mid-1990's the vast majority of their airplanes will have look down/shoot down capability and that is the time when our ATB will be coming into the service in quantities.

Senator EXON. That is my second question.

What about as of today? You anticipated my second question before you did my first one.

Five percent, 10 percent of their aircraft, fighter aircraft today have the capability?

General WILLIAMS. I can address that, I believe.

Of an estimated [deleted] Soviet interceptors, that is all interceptors that they have fielded, some of them are 20 years old and some a little over. We would estimate [deleted] of them, Fulcrum, Flanker, are accepted as look down/shoot down capable Soviet interceptors.

Something like [deleted] of that [deleted] have clearly a look down/shoot down capability as of 1985. That number will grow. I don't have the projection exactly, but that number will grow.

We think that given the overall capability of our forces with the advanced technology bomber, the relatively low radar cross section of the B–1B plus electronic countermeasures, that that still brings quite a formidable challenge to them in the Soviet Union.

Senator EXON. Thank you, gentlemen.

Thank you, Mr. Chairman.

Senator WILSON. Thank you, Senator Exon.

Gentlemen, thank you very much. We have kept you here a long time this afternoon. It has been a very useful presentation. I am sure I speak for the members who have now departed in extending our thanks to you.

I know there is another classified session scheduled on March 21. We look forward to welcoming you back.

Dr. COOPER. Thank you. We will see you tomorrow with the ICBM.

[Questions to be answered for the record follow:]

QUESTIONS SUBMITTED BY SENATOR JOHN WARNER

MIX OF HIGH YIELD GRAVITY WEAPONS

Senator WARNER. What is the basis for the mix of high yield gravity weapons, SRAMs and Air Launched Cruise Missiles? In particular, what is the rationale for a force of about [deleted] cruise missiles, and the current mix of ALCM-Bs and ACMs?

Dr. COOPER. Rationale for the mix of internal weapons (gravity, SRAM) and air launched cruise missiles (ALCM) falls into two principal areas: weapon mix analysis and force structure carriage capability.

First, Air Force analysis conducted in the late 1970s, Saber Penetrator VII, evaluated several alternative force structures and weapon mixes to achieve US targeting objectives and place maximum stress on Soviet air defenses. [Deleted.] The internal weapons are necessary for terminally defended or relocatable targets (SRAM/SRAM II) and larger target complexes which require a large yield weapon (gravity bomb) with accuracy to minimize collateral damage. Cruise missiles are necessary for defense dilution/suppression and an increase in bomber capability to range the target base.

Second, the rationale for approximately 3000 cruise missiles with a mix of ALCM-Bs and advanced cruise missiles (ACM) is both a result of Air Force analysis of targeting requirements and the actual carriage capacity of the planned force.

While the Saber Penetrator VII study focused on the internal weapon/cruise missile mix for the day-to-day alert force, a larger number of cruise missiles would be needed to load out the generated bomber force. [Deleted.]

The other impact on the number of cruise missiles for the fully generated bomber force is actual carriage capacity. [Deleted.]

The cruise missile mix of ALCM-Bs and ACM is the result of further Air Force analysis performed in the early 1980s. The study evaluated ALCM-B, an improved ALCM-B and ACM. The study focused on the best weapon to keep cruise missiles viable into the 1990s in the face of improving Soviet defenses. The analysis concluded that ACM was the best way to ensure that the cruise missile retains its effectiveness. Adjustment of cruise missile procurement programs (termination of ALCM-B and ACM start-up) resulted in a mix of [deleted]. This cruise missile force structure will remain viable as the Air Force deploys its 1990s bomber force of B-52Hs, B-1Bs and ATBs.

B-1B'S ABILITY TO PENETRATE SOVIET DEFENSE

Senator WARNER. What is the current assessment of the B-1B's ability to penetrate Soviet defenses? To what extent is this assessment dependent on operating at low altitude over the Soviet Union? Is the baseline ECM system robust in the face of anticipated threats and should we be considering ECM capabilities that are not in the B-1B baseline?

Dr. COOPER. The decision to build the B-1B was based on an assessment that it would penetrate Soviet defenses well into the 1990s. The assessment took into account both study and flight test results. There has been no change in the assessment that the B-1B is an excellent penetrator.

The B-1B penetration features are a synergistic combination of low altitude, low RCS, high speed, and ECM. The B-1B is not dependent on any one feature of its penetration design. For example, higher speed and/or more ECM are used as a supplement where necessary.

The B-1B ECM includes very robust techniques, power levels and flexibility designed to adapt to changing threats. The system is fully reprogrammable and has growth provisions to handle threat changes. Integration and feasibility studies are being done, should we need to exploit advanced ECM growth provisions at sometime in the future.

ECM PERFORMANCE FOR THE B-1B

Senator WARNER. To what extent will B-1B penetration depend on ECM performance, as opposed to tactics such as avoidance and suppression of defenses?

Dr. COOPER. The B-1B will rely on its inherent design to penetrate as well as avoidance and suppression. The B-1B design integrates high speed, very low altitude flight, low radar cross section (RCS) and ECM when needed to provide penetrativity. These four characteristics interact synergistically. The B-1B does not depend on any one feature to penetrate. For example, increased application of camouflage ECM can compensate for changes in flight profiles, and conversely, lower profiles can reduce the need for ECM.

TARGETING OF RELOCATABLE TARGETS

Senator WARNER. To what extent is the baseline B-1B capable of targeting relocatable targets ("RT's")? What additional capabilities are required for this role, and how do the operational requirements associated with this role affect B-1B survivability?

Dr. COOPER. [Deleted.] The baseline B-1B could begin to target certain classes of RTs in the near future. Additional weapon system capabilities to enhance the RT role have not yet been identified. As the B-1B's target tasking is defined, potential growth options such as improved connectivity, additional sensors and next generation ECM will be exercised if needed. The survivability of the B-1B will remain high due to the synergistic combination of its penetration design features.

B-52 MODIFICATIONS

Senator WARNER. To what extent do each of the modifications underway or planned for the B-52 force enhance performance (as opposed to reliability and maintainability) and how are these performance improvements related to the role (i.e., "shoot-penetrate", stand-off) that is planned for the B-52's?

Dr. COOPER. There are ten major B-52 modifications which enhance the performance of the B-52's "shoot-penetrate" and/or "standoff" mission. [Deleted.] The *Integrated Conventional Stores Management* program will enable conventional B-52's to carry, program and launch new conventional weapons, enhancing all conventional missions areas. The seventh modification, *MILSTAR AFSATCOM* will upgrade and enhance the communication capability of all B-52G and H missions. A development program is currently underway to enhance conventional B-52G standoff and penetration missions by providing a *high-resolution radar*, using synthetic-aperature techniques, to detect and target various target types. Both B-52Gs and Hs continue to be modified with the *Offensive Avionics System* (OAS), last procured in fiscal year 1983. The OAS has enhanced all mission areas of the B-52 by improving bombing and navigation capability. Finally, *Harpoon missile carriage/launch integration* on 30 B-52G's continues. This capability will provide a long range maritime interdiction and standoff capability for these conventional aircraft.

ALCM-B AND ACM PENETRATION PERFORMANCE

Senator WARNER. What is the current assessment of ALCM-B and ACM penetration performance against projected threats? What is the value of increased range in assessing ACM performance?

Dr. COOPER. The ALCM-B is a capable and effective penetrating weapon system and will remain so through the 1980's until terminal defenses are deployed in large numbers. The Air Force has examined several improvements for the ALCM-B to sustain its effectiveness against these new defensive systems. While several of these improvements provide for cost-effective enhancements, they still do not provide the flexibility or confidence in penetration that the ACM will. The ACM utilizes a low observables design and increased range to allow penetration of enroute and terminal defenses projected for the 1990's. The ACM's increased range is an important aspect of Strategic Air Command's requirement for the missile. The added range provides high survivability for the standoff cruise missile launch aircraft, improved routing flexibility, and [deleted].

ACM PROCUREMENT DELAY OR SLOWDOWN

Senator WARNER. Given the current mismatch between internal cruise missile carriage capability and the availability of cruise missiles, what would be the effect of a delay or slowdown in ACM procurement?

Dr. COOPER. Under the present production schedules for the ALCM-B and ACM and a 1990 IOC for the Common Strategic Rotary Launcher, there are projected to be more missiles than spaces for internal carriage of cruise missiles. A one year delay in the ACM program or a one year procurement slowdown with concommitant reduction in yearly production quantities would both cause program costs to increase by approximately [deleted]. Additionally, a production delay would cause a great deal of the production experience gained during full scale development to be lost.

The ACM represents a significant improvement in capabilities over the ALCM-B. If there are more missiles than internal carriage capacity [deleted].

MIX OF B-52'S, B-1B'S AND ATB'S

Senator WARNER. What is the rationale for the current mix of B-52's, B-1B's and ATB's? Is there a justification for the specific mix (numbers) of modern bombers? How will this mix of forces operate together across the spectrum of possible SIOP and conventional mission scenarios?

Dr. COOPER. The current mix of B-52's, B-1B's and ATB's supports national objectives through its unique contribution to the US strategic Triad.

For over 25 years, we have relied on the B-52 as the mainstay of the bomber force. However, the B-52's are becoming difficult and expensive to maintain and increasingly vulnerable to Soviet defenses and tactics.

The specific mix of modern bombers is based on estimates of Soviet defensive capabilities and the target base which must be held at risk to maintain deterrence. While exact numbers of defensive systems and targets to be struck will continue to evolve as intelligence estimates are refined, two key factors support a 1990's bomber force at least equal in size to the 1980's bomber force. First, Soviet defenses will continue to improve at least in the qualitative dimension. Second, the target base will become more difficult to attack as it grows harder and more dispersed. Important target categories such as ICBMs will become relocatable or mobile. The combination of improving defenses and a more stressing target base will require more arriving bomber weapons than the current B-52 force will be capable of delivering. The bomber modernization program is designed to provide weapons of the quality (accuracy/yield) and quantity needed to meet US national objectives in the 1990's.

In order to maintain the health of the bomber leg of the TRIAD with its unique characteristics (flexibility, reusability and recallability) and ensure TRIAD synergism remains robust, the Air Force is revitalizing the bomber force through B-52 ALCM modification and acquisition of the B-1B and ATB. While the ATB will provide a significant improvement in our ability to deal with advanced air defenses, it will not be available until the 1990's. The B-1B will be operational in 1986 and provide a near-term response to redress the strategic imbalance. The B-1B will be able to penetrate Soviet defenses well into the 1990's allowing us to shift B-52's to the less demanding SIOP cruise missile carrier standoff role. Non-ALCM B-52G's will become a dedicated conventional force in the late 1980s and acquire a land/maritime standoff attack capability with Harpoon and TACMS when it is deployed. These conventional assets will be supplemented by B-1B's which will attain a secondary conventional role in the late 80s. By the time the Soviet defenses react to the B-1B, the ATB will be deployed enabling us to shift the B-1B's to the shoot-and-penetrate and conventional roles as we retire the older B-52's.

SYSTEMS THAT RELY ON LOW OBSERVABLES AND ECM PENETRATION

Senator WARNER. To what extent does the planned force structure reflect a balance between systems that rely on very low observables for penetration and systems that rely on ECM for penetration?

Dr. COOPER. The planned force structure reflects a very good balance between systems that rely on very low observables for penetration and systems that rely on ECM for penetration. The bomber modernization program that was developed in 1981 considered this factor as part of our effort to defeat the Soviet defense system. The B-1B, with its highly effective electronic counter-measures jamming package, will force the Soviets to upgrade their existing defense network. The ATB, with its low observable design, will drive the Soviets to design and develop a new generation of defensive systems while maintaining their existing systems. Also considered in

this equation is the role the B-52 will play as a standoff cruise missile carrier for the ALCM's and ACMs. While not relying on ECM to penetrate, both the ALCM and the ACM programs are designed to enhance our force structure and further saturate the enemy defenses. Acting in concert, the ATB, B-1, and B-52 put maximum stress on the Soviet defenses and force them to divert dollars into defense that otherwise would be applied to offense.

Questions Submitted by Senator Dan Quayle

VULNERABILITY OF B-1B'S

Senator Qualye. How vulnerable is the B-1B to SA-10's?

Dr. Cooper. The SA-10 is one of the Soviet Union's most capable defensive systems; however, the B-1B is designed from the ground up to penetrate such defenses. Although the primary threats to airborne penetrators are airborne interceptors, considerable attention has been devoted to provide defense-in-depth against advanced surface threats such as the SA-10. The B-1B will degrade all parts of the SA-10 engagement sequence in a coherent manner using the synergistic effects of very low altitude, high speed, low RCS, and tailored ECM. The degradations by the B-1B against the SA-10 is well within the levels needed to assure successful penetration well into the future.

LOCATING MOVING TARGETS

Senator Quayle. One of the key advantages of penetrating bombers is their ability to hunt and target mobile targets. Assuming that we can build bombers that can penetrate Soviet air defenses effectively through the year 2000, how good are our real-time intelligence and surveillance capabilities to locate moving targets? Do we have such intelligence and surveillance capabilities now? When might we?

Dr. Cooper. [Deleted] during wartime when [deleted]. Other strategic and tactical intelligence systems can provide some intelligence information on Soviet targets, [deleted]. However, studies to determine how to [deleted] are ongoing. Preliminary results of those studies indicate that such [deleted]. However, the additional resources required for their development and acquisition have not been fully defined and are not currently programmed.

Until the real-time capability exists, we will begin to [deleted].

EFFECTIVENESS OF THE SA-10 SYSTEM

Senator Quayle. This subcommittee has received testimony from the Missile Intelligence Agency, and the Defense Intelligence Agency concerning Soviet air defense capabilities particularly with regard to its new SA-10. Just how effective does the Air Force think this Soviet system is against existing air-launched cruise missiles and what specifically is the Air Force planning to overcome such defenses?

Dr. Cooper. Because of [deleted] the SA-10A system and because its employment is [deleted]. However, based on what is known about the SA-10A, we think it would have [deleted] against cruise missiles.

The SA-10A has been [deleted] a cruise missile-type target [deleted] the site. We [deleted] of the SA-10A's potential to [deleted] cruise missile following engagement. We believe the SA-10A would not be successful in all cases. The [deleted] would be further [deleted].

The Air Force plans to overcome the threat of the SA-10A to the current air-launched cruise missile [deleted]. The Air Force currently has under development the Advanced Cruise Missile which will [deleted].

IOC FOR AUTONOMOUS TERMINAL HOMING

Senator Quayle. What can you say about the expected IOC for Autonomous Terminal Homing? Does the Air Force plan to retrofit existing air launched cruise missile air frames with this guidance technology? What level of funding would it take to accelerate this program's IOC?

Dr. Cooper. The Cruise Missile Advanced Guidance (CMAG) project in PE 63319F funds the Advanced Development of a precision guidance system which exploits the active and passive CO2 laser radar technology demonstrated in the former Defense Advanced Research Projects Agency's Autonomous Terminal Homing program. The estimated technology transition date to full scale engineering development is fiscal year 1988. The Air Force is considering a variety of existing and developmental cruise missiles for CMAG integration. It does not appear that it will be cost effective

to retrofit existing air frames. The present program represents an aggressive, well structured approach. We estimate that the technology availability date (TAD) could be accelerated by no more than 12 months with additional funding. That acceleration would produce a "tactical" version of CMAG, ready for Full Scale Development (FSD) in fiscal year 1987. It would require approximately $2.5M additional in fiscal year 1987, but no additional funds in fiscal year 1986. We do not believe that an acceleration is appropriate at this time. To gain an fiscal year 1987 TAD we will be forced to cut the critical captive carry test phase in half. That could unnecessarily increase risk in the FSD phase.

PURCHASE OF MORE B-1's

Senator QUAYLE. Under what circumstances would it make sense to buy more B-1's?

Dr. COOPER. The Strategic Modernization Program that President Reagan set in motion in 1981 included 100 B-1B's to quickly upgrade our airbreathing deterrent in the late 1980s, along with the development of the Advanced Technology Bomber (ATB) for deployment in the 1990s. The B-1B has been a major success story in staying within cost and ahead of schedule. We expect the Strategic Air Command to make its September 1986 B-1B initial operational capability (IOC) as forecast and to effectively employ the aircraft as a penetrator well into the 1990's. The ATB is also progressing well; at this time we see no technical or cost showstoppers that would delay its IOC as an excellent penetrator in the 1990s. We are on track with this "Two Bomber" program and intend to follow it through to completion as scheduled.

LONG RANGE AIR LAUNCHED CRUISE MISSILE

Senator QUAYLE. When will the Air Force have long-range (over 400 NM) conventional air-launched cruise missiles deployed on our bomber force?

Dr. COOPER. The Air Force has no stated requirement for a long range (over 400 nm) conventional air-launched cruise missile. Aircraft capable of launching cruise missiles with a range exceeding 600 kilometers (approximately 372 NM) fall under SALT II cruise missile launcher limitations. The Air Force is developing the Tactical Missile System (TACMS) as a conventional standoff weapon for both tactical and strategic aircraft. Specific information on TACMS will have to be provided in a separate forum.

EXTENDING RANGE OF THE ALCM'S

Senator QUAYLE. What is the Air Force doing to extend the range of existing ALCM's? When will such air range extensions be available?

Dr. COOPER. The Air Force has no plans to extend the range of existing ALCM's. The Air Force is developing an Advanced Cruise Missile (ACM) with improved performance. Specific performance parameters of the ACM are classified in a compartmented program.

FOLLOW-ON TO MRASM

Senator QUAYLE. Does the Air Force have any follow-on to the MRASM?

Dr. COOPER. Yes, the Air Force has a follow-on program to MRASM called Tactical Missile System (TACMS).

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN

B-1B SAVINGS

Senator LEVIN. The Air Force Technology Modernization Program (Tech Mod) is designed to reduce the acquisition costs of weapon systems through enhanced production efficiency. The B-1B program has received significant funding from the Tech Mod line (PE 78011F). Early in the B-1B program savings from Tech Mod were projected at over $800 million. The projections were subsequently reduced to $500 million in early 1984, according to GAO in February, 1985. Were the savings reduced?

a. What are the current projected savings to the B-1B program for Tech Mod efforts?

b. Explain why Tech Mod savings projections continue to decrease and what steps the Air Force is taking to stop this decline?

c. Were the increased costs of the B-1B of $300 million added to the $20.5 billion baseline cost? Why not, if they were not?

Dr. COOPER. The current projected savings to the B-1B program from Tech Mod efforts are $150 million.

Projected Tech Mod savings have decreased for several reasons. There is a "window of opportunity" to implement cost savings projects on a production line. That window starts to close quickly as production efforts begin. As production accelerates to rate, opportunities to start projects that generate savings diminish rapidly. Early savings estimates were optimistic because the "window of opportunity" appeared to be wide open. The B-1B was the first Tech Mod program that attempted to reduce target costs for each project implemented. It was also the first program to use the "return on investment" incentive method for Tech Mod projects. However, pursuing these otherwise worthwhile initiatives extended negotiations, which contributed significantly to lower projected savings.

The Air Force has worked aggressively to overcome these inherent limitations. Initially, significant program funds were used because available Tech Mod funding (PE 78011F) was insufficient. Change orders were used to start projects quickly so the savings would be maximized. The Tech Mod projects developed by the B-1B contractors are technically excellent. Savings to the B-1B program are likely to be only a small part of larger overall savings that should accrue to the government over the years.

Unlike multiyear savings, projected Tech Mod savings are not explicitly anticipated in the $20.5 billion baseline. Therefore, downward revisions in projected Tech Mod savings to the B-1B program, though disappointing, do not imply a breach in the certified cost ceiling.

COST PERFORMANCE REPORT

Senator LEVIN. The AF and CAIG were not able to do detailed Cost Performance Report (CPR) on production contracts as part of last year's revalidation. Not enough production had occurred. Has this been done by now; and what does it show regarding whether costs/schedule and required production hours actually are occurring? If not done, why?

Dr. COOPER. Program Office estimates are updated annually. The most recent assessment, which included a detailed analysis of contractor CPR data, indicated that contractor cost performance and production hour experience were on track with estimating assumptions made early in the program. Data reported since that comprehensive estimate support its accuracy. The CAIG does not routinely revalidate the costs of major systems and was not required to perform an analysis of CPR data.

FUNDS FOR ENHANCEMENTS/MODIFICATIONS

Senator LEVIN. Last year's budget had some funds for enhancements/modifications to the B-1B. More funds were projected for fiscal year 1986. How much is in the fiscal year 1986 budget request for this; for what work; and why is it necessary if the B-1B is such a capable aircraft? Are the costs in the $20.5B?

Dr. COOPER. The fiscal year 1986 President's Budget includes $5.1 million for adding a dual modem capability to the B-1B's AFSATCOM terminals. This required funding is not included in the $20.5 billion B-1B baseline. AFSATCOM terminals, without the upgrade, are part of the B-1B baseline configuration. The dual modem capability, now in development, will allow a UHF radio link with MILSTAR satellites as they are deployed. The Air Force is attempting to include this new capability as early as possible by intercepting the AFSATCOM fabrication line and changing the final configuration of AFSATCOM terminals to include this new capability as early as possible. At this time, we have not determined if this intercept can be accomplished to affect the configuration of the 100 AFSATCOM terminals already ordered for the B-1B. If it is possible to intercept the fabrication line, there will be some credit to the production line for the unaccomplished fabrication labor. The cost of the raw materials, however, has already been totally obligated and cannot be recovered. The new configuration still must be procured to provide the dual modem capability. The modification request to procure the replacement cards to upgrade the terminals requires the use of 3010 (BA5) dollars which are outside B-1B baseline procurement funding.

COMPONENT PRODUCTION SCHEDULES

Senator LEVIN. Defensive Avionics system components and offensive radar systems components are behind schedule according to GAO last month. If true, why, how much added cost is there, and when will the problems be resolved?

Will any B-1B's finish production with substandard systems for which fixes will have to be retrofitted at added costs?

Dr. COOPER. The Air Force will not intentionally accept "substandard" systems. We are aware of no fixes which will have to be retrofitted at added cost.

There have been slippages in scheduled deliveries of both offensive and defensive avionics components. The offensive radar system components slippages are to only the internal schedule between Boeing and its subcontractor, Westinghouse. The overall offensive avionics delivery schedule contains adequate reserve to fully support the accelerated aircraft production and delivery schedules without impact.

Delays in deliveries of subcomponents to Eaton Corporation are affecting defensive avionics component production. However, efforts are underway to obtain additional vendor sources for these key parts, so the impact will only be temporary. The accelerated aircraft delivery schedule will not be slowed down by late component deliveries. We have already identified and implemented workarounds to allow some early B-1Bs to be delivered to SAC with certain components held back. Component deliveries will have caught up in ample time to meet all requirements for IOC and beyond with fully configured aircraft.

SOVIET SDI SYSTEMS

Senator LEVIN. Are you concerned about the impacts a Soviet SDI system might have on the Air Force's ability to perform its mission?

Dr. COOPER. We must, of course, be concerned about a potential Soviet technological breakthrough in the area of strategic defense. However, the President's strategic modernization program provides us a measure of insurance against such a sudden Soviet advantage. The continuing improvement of our strategic Triad's capabilities helps ensure that no single Soviet technological advance can neutralize the deterrent effect of our strategic offensive forces.

MAJOR IMPLICATIONS

Senator LEVIN. Don't these issues have major implications for the size, cost and composition of future U.S. strategic forces and thus for our capabilities to perform its mission?

Dr. COOPER. Yes, Soviet SDI will have an impact on size, cost and composition of U.S. strategic force structure when such a system is deployed. The President's strategic modernization program will deploy B-1B/ATB, Peacekeeper, SICBM, Advanced Cruise Missile (ACM), and Trident/D-5 during the next ten years. These new systems will invigorate the current Triad and provide the capability to mitigate potential vulnerability to projecteed Soviet defenses.

UPDATED CERTIFICATION OF BASELINE

Senator LEVIN. Last year, Dr. Cooper, I asked several questions about the updated certification the AF made of the $20.5 billion baseline B-1B program. I questioned how the Air Force could revalidate that cost since there was not enough production experience upon which to base this revalidation. I questioned whether the learning curves projected as part of the $20.5 billion—and which are a major portion of the reason why the cost is supposedly lower than OSD's independent CAIG estimated they would be—actually were being realized. The Air Force responded: (March 9, 1984) As of this date, Lot I is approximately 50-60 percent complete and Lot II is less than 15 percent complete. As a result, it is not meaningful to discuss actual learning experienced to date on B-1B production contracts.

One year later, have you had enough production experience on the airframe and avionics to see whether the learning curves are as predicted. If not, when? If so, what are they and what are the cost impacts?

Dr. COOPER. During the past year, the B-1B production program has made significant progress. Production effort on Lot II (B-1Bs number two through number eight) is 50 to 75 percent complete. Lot III effort (B-1Bs number nine through number eighteen) is 25 to 35 percent complete.

The Program Office's latest annual cost estimate indicated that contractor cost performance and production experience were on track with estimating assumptions made early in the program. This recent assessment was in part based on an analysis

of cost improvement curves which represent contractor performance (and reflect "learning") at functional levels such as manufacturing, engineering, material, and subcontracts.

Moreover, data reported since that comprehensive estimate fully support its accuracy. We remain confident that we will be able to execute the remainder of the B-1B production program with the procurement funding requested in the fiscal year 1986 President's Budget.

DESIGN OF ICBM'S & SLBM'S

Senator LEVIN. Are you concerned whether we will have to change the designs of our ICBM's and SLBM's to defeat a Soviet SDI?

Dr. COOPER. In the near term, until SDI technologies are proven by the United States and the Soviet Union, the U.S. Air Force will need to sustain a research and development program for penetration aids to counter the less-advanced terminal defenses that the Soviets are currently developing or deploying.

In the far term, we are hopeful that SDI research will show that cost-effectiveness favors the defenses, in which case, both the U.S. and the Soviet Union will find it impractical to further modify or proliferate ICBM's and SLBM's in order to allow them to penetrate. In the meantime, we must continue research both on defenses and on potential countermeasures to them, in order to prove that SDI systems cannot be easily defeated.

If SDI research does not indicate that the cost trades favor the defenses, the new countermeasures might provide a basis for continued deterrence by offense alone. Hence, it is prudent that we simultaneously pursue SDI and countermeasures to it until such time, presumably by the early 1990s, that we can make an informal decision whether or not to produce and deploy selected SDI systems.

In the final analysis, one of the best "countermeasures" to an effective Soviet ballistic missile defense system is an equally effective one of our own.

PROLIFERATION OF PENETRATION AIDS

Senator LEVIN. Are you concerned whether we will have to proliferate the number of missile warheads, decoys and other penetration aids we deploy to defeat the Soviet SDI?

Dr. COOPER. We are concerned about the Soviet's Anti-Ballistic Missile (ABM) defense capabilitiy. However, we believe that our ICBM penetration aids development progrm is sufficient to counter the most likely threat projection. The penetration aids that are currently deployed on the Minuteman III missile [deleted]. This program will provide a capability against the [deleted] and this technology will be readily transferable to the Peacekeeper missile if the need arises. Should SDI technology be proven, it may be impractical to preliferate ballistic missile penetration aids. In the mean time, it is prudent to continue technology development on penetration systems.

PROPER COUNTERMEASURES

Senator LEVIN. Do you think SAC should be taking an active role in assessing proper countermeasures to a Soviet SDI—not only to address the above issues but to make sure our R&D people have full benefit of SAC's operational experience in this task. Isn't designing something in a laboratory a bit risky without knowing whether it makes sense operationally in the field, when the real world of bad weather, different personnel, movement, tactics, all must be considered?

Dr. COOPER. SAC does, in fact, take an active role in both threat assessment and the research and development of new systems needed to counter the threat in its assigned mission areas. Additional studies along this line would be undertaken by the Ballistic Missile Office of AFSC. This allows the full benefit of SAC's operational experience and BMO analysis to be brought to bear on the problem. Such involvement serves to lower technological risk and ensure that the systems developed are suited to the missions to be performed.

CHARACTERISTICS OF A SOVIET SDI SYSTEM

Senator LEVIN. Have you even discussed with General Abrahamson or other SDI experts, perhaps in the intelligence community, what they think a Soviet SDI would be like and what might be possible ways to develop countermeasures to it?

Dr. COOPER. Yes. The Soviets are pursuing a comprehensive strategic defense program that was begun before the U.S. even considered such a program. Some of the pieces of a Soviet ballistic missile defense system are already deployed, others are either ready to be deployed in the near future or are in development. In addition to

the upgrades of their Moscow ABM system—the world's only operational ABM system—the Soviets seem to have placed themselves in a position to field a nationwide ABM system should they decide to do so. Also, the Soviets are pursuing directed energy development programs which have the potential for ballistic missile defense, as well as antisatellite weapons, and air defense. Our judgment is that the Soviets are pursuing a high technology program similar to SDI, that could lead to an advanced, operational system after the year 2000. The Soviets could deploy a nationwide defense based on more mature technologies within the next ten years.

CONSIDERATION OF COUNTERMEASURES

Senator LEVIN. Secretary Weinberger says he thinks a Soviet SDI would be "one of the most frightening prospects" imaginable. Shouldn't we be considering what countermeasures are needed?

We spent great effort worrying about how to counter Soviet air defenses against bombers and its present BMD system. We worry about whether various programs in the annual budget request are approved for this reason—such as counter-Soviet AWACS-SUAWACS; Advanced Strategic Missile Systems (anti-BMD); many electronic warfare systems against air defense radars. Shouldn't we worry about how much money and effort, and what types, are being expended to counter a Soviet SDI?

Dr. COOPER. In the near term, until SDI technologies are proven by the U.S. and the Soviet Union, the U.S. Air Force will need to sustain a research and development program for penetration aids to counter the less-advanced terminal defenses that the Soviets are currently developing or deploying.

In the far term, we are hopeful that SDI research will show that cost-effectiveness favors the defenses, in which case both the U.S. and the Soviet Union will find it impractical to further modify or proliferate ICBMs and SLBMs in order to allow them to penetrate. In the meantime, we must continue research both on defense and on potential countermeasures to them, in order to prove that SDI systems cannot be easily defeated.

If SDI research does not indicate that the cost trades favor the defenses, the new countermeasures might provide a basis for continued deterrence by offense alone. Hence, it is prudent that we simultaneously pursue SDI and countermeasures to it until such time, presumably by the early 1990s, that we can make an informed decision whether or not to produce and deploy selected SDI systems.

In the final analysis, one of the best "countermeasures" to an effective Soviet ballistic missile defense system is an equally effective one of our own.

[Whereupon, at 4:05 p.m., the subcommittee adjourned, subject to the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1986

WEDNESDAY, MARCH 6, 1985

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

ICBM MODERNIZATION PROGRAM

The subcommittee met in open session, pursuant to notice, at 9:04 a.m., in room SR-222, Russell Senate Office Building, Senator John W. Warner (chairman) presiding.

Members present: Senators Warner, Goldwater, Cohen, Wilson, Nunn, Hart, Exon, Levin, and Glenn.

Staff present: Patrick A. Tucker, counsel; Arnold L. Punaro, staff director for the minority; Robert E. Bayer, Robert G. Bell, Robert F. Bott, Douglas R. Graham, William E. Hoehn, Jr., George K. Johnson, Jr., Ronald P. Kelly and David S. Lyles, professional staff members; Russell C. Miller, Patricia L. Watson, research assistants, and Karen A. Love, staff assistant.

Also present: Gerald J. Smith, assistant to Senator Goldwater; Romie L. Brownlee, assistant to Senator Warner; James M. Bodner, assistant to Senator Cohen; Robert P. Savitt, assistant to Senator Cohen; Henry D. Sokolski, assistant to Senator Quayle; Mark J. Albrecht, assistant to Senator Wilson; Allan Cameron, assistant to Senator Denton; Janne E. Nolan, assistant to Senator Hart; Jeffrey B. Subko, assistant to Senator Exon; Peter D. Lennon, assistant to Senator Levin; and Phillip P. Upschulte, assistant to Senator Glenn.

OPENING STATEMENT BY SENATOR JOHN W. WARNER, CHAIRMAN

Senator WARNER. Good morning, ladies and gentlemen.

The subcommittee convenes in open session this morning to receive testimony from administration and outside witnesses on the ICBM modernization programs in review of both the resolutions of approval for release of fiscal year 1985 funds for MX and the fiscal year 1986 defense budget request.

On February 26, the full Committee on Armed Services conducted a hearing in which Secretary of State Schultz and Secretary of Defense Weinberger stressed the importance of the MX missile in

connection with the upcoming arms reduction negotiations with the Soviet Union.

Today, this subcommittee will review the MX program as it relates to enhancing the credibility of our deterrent posture, a role that should not be overlooked as we approach upcoming congressional votes.

This morning's hearing was to be organized in three separate panels. However, due to the scheduling of a joint session of Congress at 11 this morning to hear from the Italian Prime Minister Bettino Craxi, it is the Chair's intention to defer the second and third panels until the subcommittee reconvenes this afternoon at 2.

Our panel this morning consists of Gen. Bennie Davis, U.S. Air Force, the commander in chief of the Strategic Air Command.

General Davis, we note here that your tenure in this important post will come to a conclusion this year. I am sure other members of the subcommittee join me in congratulating you on your fine service to this country not only in this post but prior posts.

Chairman GOLDWATER. I would like to add one thought to what you have just expressed. I look upon him as not the last of the Mohicans, I think he is the last World War II pilot who flew fighters and bombers. We are going to miss him.

Senator WARNER. Senator Glenn?

Senator GLENN. I would like to echo those remarks also, having had a little experience in that era myself.

General, I appreciate your hospitality on the visit we had out there last summer. It was very, very informative. We had an excellent trip after we left your headquarters on some of the things we discussed at that time.

I am pleased to be with you today.

General DAVIS. Thank you, sir.

Senator WARNER. General Davis?

STATEMENT OF GEN. BENNIE DAVIS, U.S. AIR FORCE, COMMANDER IN CHIEF, STRATEGIC AIR COMMAND, OFFUTT AIR FORCE BASE, NE

General DAVIS. Good morning, Mr. Chairman, Senator Goldwater, Senator Glenn.

It is a pleasure to be here today to discuss from an operational commander's point of view the requirements necessary to ensure our strategy of deterrence remains credible.

As you point out, I come to the close of 35 years of contented—I will put it that way—and very satisfying service.

It is a particular pleasure to be here this morning to discuss the operational requirement behind MX and the significant capability that it adds to our strategic deterrent posture.

Today the primary challenge to our national security is indeed that vast Soviet materiel arsenal and the progress that the Soviets are making in putting together that significant strategic force because you gentlemen have seen in your visits to Strategic Air Command headquarters, particularly as we talk about the threat or the buildup of the Soviet strategic forces as they are modernized, the tremendous amount of money the Soviet Union puts in research

and development and the tremendous amount of money and what they dedicate in terms of their industry to military is significant.

Fortunately, the President, the Congress and the American people recognize the risks inherent in a strategic imbalance and in 1981 embarked on and continued the comprehensive strategic modernization programs.

I cannot emphasize enough my full support for the program which has already produced significant improvements in our strategic retaliatory capability and significantly the air-launched cruise missile which was started prior to 1981, but is certainly bearing fruit today.

It is absolutely essential that we continue this effort to modernize our strategic forces; that is, all three legs of the triad, as well as our strategic command, control, and communications systems and our strategic defense capabilities.

We are now on the verge of achieving significant goals in our Strategic Modernization Program. To ensure these goals are reached, it is vital that we sustain the momentum we have worked so hard to achieve. Nowhere is this more true than in the case of MX deployment. It is extremely important that the Congress vote to release the fiscal year 1985 MX funds, to approve the fiscal year 1986 funding request and allow us to complete this critically needed program.

Today the Soviets can significantly threaten our ICBM force while we have only a limited capability to place their ICBM's at risk. This Soviet advantage, more than any other factor in the current strategic situation, undermines stability and threatens peace by allowing the Soviets to believe their political objectives can be successfully obtained through the use of coercion or force.

MX represents the best and, as a matter of fact, the only near-term solution to redress the present imbalance in prompt time urgent capability against those hardened targets. It is an urgent military requirement that is absolutely essential to reduce the current disparity between the United States and Soviet strategic forces.

Lest my emphasis on the need for a prompt hard target capability not be misunderstood, it is for deterrence and not fighting a war which is the overriding reason for MX deployment.

Deployment of 100 MX missiles with 10 warheads each will raise doubts in the minds of the Soviet war planner as to their success in initiating an offense. However, it does not represent a destabilizing potential because the proposed deployment cannot place the majority of the high value Soviet targets at risk. Still MX can convincingly threaten enough of these targets to deter.

For over a decade we searched for a perfectly survivable ICBM basing mode. While survivability is certainly a vital concern, the essence of deterrence is capability, not vulnerability. The whole question of the window of vulnerability that was raised some years ago did not relate specifically to the vulnerability of the missile silos.

Instead it had to do with the Soviets' strategic nuclear forces overtaking and surpassing U.S. capability. Nevertheless, since 1976 much of the debate over MX deployment has consistently focused on the survivable basing issue.

The situation, however, has changed since then. Individual missile survivability is better today than we projected and can be further enhanced. Improved and survivable warning systems that incorporate dual phenomenology now provide a more timely and assured attack definition.

As a matter of fact, we were concerned back in 1976 about our command and control. Today's improvements in a command and control and communications network provide a higher level of confidence to communication with alert crews in a stressed environment, and due to a better understanding of inherent geological characteristics at Francis E. Warren Air Force Base, site of the MX deployment, we discovered that existing silos are harder than originally thought.

Furthermore, research over the last year provides highly encouraging indications we can build silos with hardness levels much greater than current designs. We are well into the MX testing phase and I am happy to note that it is the most successful ICBM Program in history.

After seven test flights, the missile continues to perform exceptionally well, achieving accuracies which are much better than the design requirements.

Finally, MX deployment is vital to achieving success in the upcoming and future arms control negotiations. Through past experience we have learned that entering arms talks from a position of strength is a fundamental prerequisite for serious meaningful negotiations with the Soviets. In this regard, MX deployment is a key factor. It will demonstrate national resolve and convince the Soviets we are taking steps now to protect our vital national interests.

I think it is worth repeating the following from the Scowcroft Commission report which noted:

> It is illusory to believe that we could obtain a satisfactory agreement with the Soviets limiting ICBM deployment if we unilaterally terminated the only new ICBM Program that could lead to deployment in this decade.
>
> Abandoning Peacekeeper at this time in search for a substitute would jeopardize, not enhance, the likelihood of reaching a stabilizing, equitable agreement.

Today the greatest challenge we face is to prevent war and preserve national security by maintaining the credibility of our deterrent posture. With the support of the Congress and the American people, I am confident we will continue to meet this challenge and promote a safer and more stable world.

I thank you for this opportunity once again to explain from an operational commander's point of view the military requirement necessary to ensure a credible deterrent posture.

As Commander in Chief, Strategic Air Command, as you know, I am responsible for the day-to-day control of two legs of our strategic triad. As Director of Strategic Planning, I am charged with the war planning for all three legs of our strategic triad, our strategic retaliatory force.

It is from this perspective that I am happy to be here to address your questions having to do with the deployment of MX, its contribution to strategic nuclear deterrence and the will expressed by the deployment of this system, particularly as our negotiators go to Geneva to talk about arms control.

Thank you, Mr. Chairman.

Senator WARNER. Thank you.

General DAVIS. With your permission, I would like my full statement to be entered into the record.

Senator WARNER. Without objection that will be done.

[The prepared statement of General Davis follows:]

PREPARED STATEMENT OF GEN. B.L. DAVIS, COMMANDER IN CHIEF, STRATEGIC AIR COMMAND AND DIRECTOR, STRATEGIC TARGET PLANNING

Mr. Chairman and members of the SASC Subcommittee on Strategic and Theater Nuclear Forces, I am pleased to be here today to share my views on our common goals of maintaining the freedom and security of this great Nation. I appreciate the interest and concern of the Congress and I am confident that we will continue to make the decisions necessary to ensure these goals are preserved.

As a nation we are indeed fortunate to possess the inherent strengths that allow us to realistically aspire to a peaceful and free existence. Our economic and political strength as well as a strong national will to defend our vital interests combine to ensure we are able to meet our fundamental national security objective—preserving the U.S. as a free nation with our fundamental institutions and values intact.

As Commander-in-Chief Strategic Air Command I am responsible for the day-to-day operational control of two-thirds of our triad of nuclear forces. As Director Strategic Target Planning I am also charged with planning for the execution of the entire triad. It is from this perspective that I shall discuss the operational capabilities necessary to ensure our strategy of deterrence remains credible. For indeed, the cornerstone of our deterrent strategy—strategic nuclear forces— must have a capability that leaves no doubt in a potential aggressor's mind that he could not succeed by threatening or initiating aggressive acts against this Nation.

Today, the primary challenge to our national security is the vast military arsenal of the Soviet Union. Through a massive military build-up encompassing qualitative as well as quantitative improvement to both offensive and defensive strategic systems, the Soviets are now significantly altering critical components of the overall strategic balance. This unprecedented build-up clearly exceeds legitimate defense of the Soviet homeland. If this build-up is allowed to continue unchecked, there is a real danger that the Soviets will come to perceive that they have the strength to pursue their political objectives through military means.

Clearly, any altering of the strategic balance in the Soviet's favor poses a significant threat to stability and peace. Not only does this increase the risk of nuclear coercion, it also allows the Soviets to feel more secure in using their already superior conventional forces to achieve their goals.

Fortunately, the President, the Congress and the American people recognized the risks inherent in a strategic imbalance and in 1981 embarked on a comprehensive strategic modernization program. I cannot emphasize enough my full support for this program which has already produced significant improvements in our strategic retaliatory capability:

We have now equipped five B-52G squadrons with air-launched cruise missiles (ALCM) and have armed one B-52G squadron with harpoon anti-ship missiles.

The effectiveness of our Minuteman force has been enhanced through accuracy and connectivity improvement programs.

Ongoing deployment of Trident submarines continues to strengthen the capability of our sea-based deterrent force.

It is absolutely essential that we continue this effort to modernize our strategic forces—all three legs of the triad as well as our strategic command, control and communication systems and strategic defense capabilities.

As the President has noted, effective command, control and communication systems are a vital element of our strategic deterrent posture. Put simply, these systems enable our strategic forces to do the job. To that end, we are pursuing programs to ensure that the capability of our command, control and communications network is commensurate with that of the modernized forces we will soon deploy.

We are also now pursuing long needed programs to bolster our capability to detect and defend against attack. Modernization of tactical warning systems and air defense forces is certainly vital, especially in light of Soviet efforts to deploy an expanded, fully modernized long-range bomber force complemented by air- and sea-launched cruise missiles.

Additionally, I applaud the administration's commitment to pursue research on new defensive technologies through the strategic defense initiative. Over the long term, this ongoing research could yield new opportunities to enhance deterrence.

Turning to our strategic retaliatory forces, the sea-based leg of the triad will be even further improved through continued deployment of the Trident submarine. Additionally, development continues on the new D–5 missile. When deployed, the D–5 will improve the counterforce capabilities of the SLBM fleet and enhance the planning flexibility of future directors of strategic target planning.

Our efforts to modernize the bomber leg of the triad are progressing quite well. We are currently planning to modify the B–52H's for ALCM carriage and our two-bomber program to develop and deploy the B–1B and ATB is well on track. Together, the B–1B and ATB will present a formidable challenge to Soviet air defenses well into the 21st century. Furthermore, an advanced, state-of-the-art bomber offers the best potential for dealing with the growing threat posed by Soviet relocatable weapon systems.

To ensure the effectiveness of our current ICBM force, we are pursuing a number of initiatives that will keep Minuteman reliable, responsive and supportable. In accordance with the Scowcroft Commission recommendation, a sequential ICBM modernization program is also underway. The program is centered on the deployment of 100 MX missiles beginning in 1986 as well as development of a small ICBM to be deployed in the next decade.

Concerning the first phase of our ICBM modernization program, I join the positions of the President, the Secretary of Defense and the Joint Chiefs of Staff in urging your support for the immediate and continued deployment of the MX. Clearly, MX is an urgent military requirement that is absolutely essential to reduce the current disparity between U.S. and Soviet strategic forces. It will counter the Soviet's superiority in prompt counter-military capability and keep their most valued strategic systems out of the sanctuary they are striving to develop. Furthermore, MX will undergird our efforts to achieve equitable and verifiable arms control agreements. I will expand on these points in a moment.

Research continues on a small ICBM with emphasis on missile design and basing configurations. Together with MX, the small ICBM will insure a balanced ICBM into the next century.

In sum, our strategic modernization program is generally well on track. We have made much progress since program initiation four years ago and are now on the verge of achieving significant goals established in our overall objective to modernize the key components of our strategic deterrent force. To ensure these goals are reached, it is vital that we sustain the momentum we have worked so hard to achieve.

Nowhere is this more true than in the case of MX deployment. It is extremely important that the Congress release the FY 85 MX funds, approve the FY 1986 funding request, and allow us to complete this critically needed program.

Today, we face a highly destabilizing situation. The Soviets can significantly threaten our ICBM force while we have only a limited capability to place their ICBM's and other key hardened assets at risk. This Soviet advantage, more than any other factor in the current strategic situation, undermines stability and threatens peace. If not redressed, it may lead the Soviets to believe their political objectives can be successfully attained through the use of coercion or force.

MX represents the best—the only near-term solution to redress the present imbalance in prompt, time-urgent capability against hardened targets. As I stated in a previous appearance before the Congress, "A fundamental precept—and paradox—of nuclear deterrence is that in order to avoid a nuclear war, we must possess weapon systems with the requisite yield and accuracy to promptly threaten what the Soviets hold most dear—their own hardened strategic assets and command facilities." The current disparity in military capabilities will not be redressed, nor will stability be returned to the strategic equation, until we possess the prompt retaliatory capabilities inherent in a system like the MX.

Let my emphasis on the need for a prompt, hard-target capability not be misunderstood. Deterrence—not fighting a war—is the overriding reason for MX deployment. The military capability of MX represents the safest and most effective means available today to achieve our desired goals of stability and lasting peace.

Deployment of 100 MX missiles with 10 warheads each raises doubts in the minds of Soviet war planners as to the success of their initiating an attack. However, it does not represent a destabilizing preemptive potential because the proposed deployment cannot place the majority of high value Soviet targets at risk. Still, MX will convincingly threaten enough of these targets to deter.

For over a decade, we searched for a perfectly survivable ICBM basing mode. While survivability is certainly a vital concern, the essence of deterrence is capability, not vulnerability. The whole question of a "window of vulnerability" that was raised some years ago did not relate specifically to the vulnerability of missile silos.

Instead, it had to do with the Soviet strategic nuclear forces overtaking and surpassing U.S. capability. Nevertheless, since 1976 much of the debate on MX deployment has consistently focused on the survivable basing issue. The situation, however, has changed since then. Individual missile survivability is better than we projected and can be further enhanced:

Improved and survivable warning systems that incorporate dual phenomenology now provide a more timely and assured attack definition.

Improvements to our command, control, and communications network provide a higher level of confidence to communicate with alert crews in a stressed environment.

Due to a better understanding of the inherent geological characteristics at F.E. Warren AFB, we have discovered that existing silos are harder than originally thought.

Furthermore, research over the last year provides highly encouraging indications that we can build silos with hardness levels much greater than current designs.

We must also recognize that the collective strengths of an effective, fully modernized triad reduce the requirement that any one leg taken in isolation must be impervious to attack. One example of how our strategic systems work in concert to promote one another's survivability is the timing problem involved in a simultaneous Soviet attack against our ICBM and bomber forces. A simultaneous Soviet launch of SLBM's and ICBM's would provide approximately 15 minutes for a retaliatory launch of U.S. ICBM's between the time of confirmed SLBM detonation on U.S. bomber bases and arrival of Soviet ICBM's. An attempt to achieve simultaneous impact would require early launch of Soviet ICBM's, thereby providing tactical warning for U.S. bomber escape. The timing problem posed by our triad serves a very fundamental purpose—our SLBM's, together with a large complement of bombers and ICBM's, will be able to hold at risk the full range of Soviet strategic assets.

The MX should not be seen as a revolutionary new weapon system. Rather, it should be viewed for what it is—a logical, modern ICBM complement for the aging Minuteman force that builds on over 20 years of experience. MX presents all of the valuable characteristics inherent in Minuteman—low operating costs, high alert rate, redundant command and control and rapid retargeting capability.

It is important to note that the MX program will continue within schedule and budgeted cost. We are well into the testing phase and I am happy to note that it is the most successful ICBM Program to date. After seven test flights, the missile continues to perform exceptionally well, achieving accuracies which are better than our design requirements.

In my opinion, nothing could be more detrimental to our efforts to redress the current strategic imbalance than canceling the MX and concentrating our efforts on developing and deploying a new small missile. While research on a small ICBM must certainly continue, the Nation cannot afford to wait years for promising technologies to be realized. Technology—no matter how promising—does not deter. Only a visible, deployed capability deters. Furthermore, without MX the Soviets would be in a better position to concentrate their efforts on defeating the small ICBM—both during its development phase and after it is deployed.

For these reasons, it is extremely important to continue with a sequential, time-phased ICBM modernization program that takes advantage of current and future weapon system capabilities. The counterforce capability of the MX is needed now to redress the strategic imbalance and increase deterrence in the near term. The small ICBM will further enhance deterrence and promote stability in the far term through its single warhead design and ability to be deployed in more survivable configurations. This integral approach to ICBM modernization is vital to ensure a continuum of deterrence and stability well into the foreseeable future.

There is one final point that should be addressed concerning the need for the MX—as well as the requirement to modernize our strategic forces in general. That is the influence modernization will have on arms control negotiations.

MX deployment is a key factor in achieving success in upcoming and future arms negotiations. It will demonstrate national resolve and convince the Soviets we are taking steps now to protect our vital national interests. In short, MX deployment represents the primary near-term incentive for the Soviets to negotiate.

In our commitment to far-reaching nuclear arms reductions that are equitable and verifiable, overall strategic modernization will clearly provide increased leverage at the negotiating table. Through past experience, we have learned that entering arms talks from a position of strength is a fundamental prerequisite for serious, meaningful negotiations with the Soviets. We learned this lesson in the early 70's when renewed U.S. interest in strategic defense resulted in the ABM treaty. More

recently, with continued NATO deployment of intermediate-range nuclear forces, the Soviets are now coming back to the negotiating table.

Today, there are many challenges before us. We are faced with making some very difficult choices to balance limited national resources against many competing and important priorities. In my mind, the greatest challenge we face is to prevent war and preserve national security by maintaining the credibility of our deterrent posture.

To meet this challenge, it is vital that we continue to modernize our strategic forces. A strong deterrent is essential to maintain peace. With the continued support of Congress and the American people, I am confident we will strengthen our deterrent posture and promote a safer, more stable world.

I thank you for this opportunity to share my views and will be happy to answer any questions you may have.

Senator WARNER. General, we have had this year a series of witnesses testifying with respect to when this Strategic Modernization Program commenced. On page 2 you use as a benchmark 1982. But in a spirit of objectivity, I do believe most of the programs you recite there were indeed initiated prior to 1981.

Perhaps the Harpoon might be an exception. I am not sure what the date of that was. Nevertheless, we thinking about integrating the Harpoon in the Air Force as far back as when I was in the Department of the Navy.

General DAVIS. Yes, sir. As a matter of fact, I believe I remarked in my opening comments that indeed the air-launched cruise missile which has been a significant addition to the triad was indeed started prior to 1981.

Senator WARNER. This is not to say that President Reagan and his administration and the Secretary of Defense haven't put a very strong emphasis on strategic modernization, indeed provided the impetus which places us today at the forthcoming negotiations in Geneva in a position of credibility and respectability.

MX FUNDING

Now, the issue of survivability in the President's report on the release of the 1985 funding for MX is based on the technical viewpoint the Peacekeeper missile, based in Minuteman silos, will be sufficiently similar to the currently deployed Minuteman ICBM.

Do you have any different view with respect to that assessment?

General DAVIS. Sir, from an operational commander's point of view and going back to the Scowcroft Commission report which indeed talked about the efficacy of a triad and the triad approach, overwhelming one leg of the triad in isolation of the consideration of the other two legs is really not a very realistic scenario.

All of our discussions, and they have been discussions where both sides of the argument have certainly presented crisp facts, unfortunately, they have confined themselves in the case of MX, against the MX, as though MX was the only object of the Soviet attack, the Soviet laydown.

That simply is not a useful scenario. It is perhaps useful for worst casing. The fact of the matter is under an absolute worst case, which is a ride-out scenario—indeed in classified testimony we have talked about the numbers that survive, I look on the positive side and look at it from the Soviet military planner's point of view.

Like the U.S. planner, he must worst case it. He must worst case his scenario for attacking the U.S. strategic triad and give maximum credit to each leg of that triad; and you, therefore conclude that with communications systems, with the high percent, virtually 100 percent of the ICBM's that are on alert, with the inherent accuracies, they have to give full credit to that.

My whole point is that I think we have properly concentrated on the survivability issue, but we have blown it out of proportion by concentrating all of the Soviet capability against the ICBM in isolation of the other two legs of the triad.

SURVIVABILITY OF MX

Senator WARNER. What can we provide here in open testimony this morning with reference to the several scenarios that are utilized for planning purposes as to the survivability of MX?

We could start, I suppose, theoreticaly with a launch on warning, you have a hundred percent survivability?

General DAVIS. Yes, sir.

Senator WARNER. Now, take it from there.

General DAVIS. In open hearing I have to be very careful how far I can take it, Mr. Chairman.

Senator WARNER. This is so important to the forthcoming debate. Let us see what we can do to provide the material.

General DAVIS. The point I made in my statement, that is, warning systems, better warning systems with dual phenomenology, you have a better capability of characterizing that attack in a survivable way so that you are not reading with radar a flock of geese.

You have with the dual phenomenology a real first-rate capability to understand and describe that attack. Then one must assume, and again worst casing it, that it is indeed a triad attack because if it is going to be a first attack, it has to be a large enough attack to be effective.

Then as we get closer, then obviously the decisions are paramount, the Presidential decision is paramount, so there must be unambiguous evidence that we are indeed under attack. But with the communications that we have today that we didn't have when we started back in 1981, that we are installing and have installed today, we have a far better capability of executing all three legs of that triad under an attack.

Senator WARNER. What you are saying is that in the 12 months that have ensued since you were before this subcommittee, communications systems have improved to such an extent that there is now a much higher degree of credibility with respect to warning facts; is that correct?

General DAVIS. Yes, sir. It was coming together a year ago and we have a higher level of confidence today, yes, sir.

Senator WARNER. In view of the new figures with respect to the existing hardness of MX silos or the Minuteman silos into which MX will be placed, may I presume that there is a greater degree of survivability in a scenario of launch under attack?

Could you take us through that?

General DAVIS. Yes, sir. Our methodology has improved in looking at hardnesses and with different geology, particularly, and in

my comments with respect to installation of MX at Francis E. Warren, the answer to that is yes, our methodology is better and a higher fraction would survive in a laydown scenario, yes, sir.

Senator WARNER. My time is up.

Mr. Chairman?

ACCURACY OF WEAPON SYSTEMS

Chairman GOLDWATER. I have just one question, gentlemen. If you don't feel that this can be answered in the open session, say so and we will pursue it some other way.

I am very interested in the subject of accuracy with any weapon system. If you can't hit the target, it is not worth anything.

General DAVIS. Yes, sir.

Chairman GOLDWATER. We keep hearing that the MX has greatly improved accuracy.

No. 1, have we ever tested the MX?

I know we have never tested it with an actual warhead. Have we tested it with a dummy warhead?

General DAVIS. Yes, sir.

Chairman GOLDWATER. What has been the CEP, if you can divulge that, of a complete down-range shot?

General DAVIS. The CEP, sir, I can't talk about in the open hearing, but when we go closed, I can.

Suffice it to say, with each system you have a specification, a spec. That is what you require in order to do the job. We are below that spec by almost 50 percent, it is that much better than the spec, which is that much better than the best system we have which is Minuteman III with a MK-12A warhead.

Chairman GOLDWATER. How many tests like that with complete equipment have been made?

General DAVIS. Seven.

Chairman GOLDWATER. Is that on Johnston Island?

General DAVIS. It is a combination of Kwajalein and the broad ocean area and the ranges will vary, so that it will fly itself programmed down range.

Chairman GOLDWATER. Is there some member of your staff that could brief me?

I have a feeling that this would be classified.

General DAVIS. Yes, sir.

Chairman GOLDWATER. Is there a member of your staff who could stop by while you are in town and give me the numbers?

General DAVIS. Yes, sir, we will be happy to do that, Senator, because we are indeed proud of the results.

Chairman GOLDWATER. It is everything you wanted it to be?

General DAVIS. Yes, sir. It is better than we had hoped for.

Chairman GOLDWATER. That is all I have, Mr. Chairman.

Senator WARNER. Mr. Nunn?

Senator NUNN. Thank you, Mr. Chairman.

I want to join you and Senator Goldwater and Senator Glenn in welcoming General Davis here this morning.

I am sorry that I did not hear all your testimony. I am trying to catch up on it, gentlemen.

I have two or three questions.

LAUNCH UNDER ATTACK POLICY

I know we have always reserved the option of launching under attack. We have never foreclosed that option, but we have had Secretary of Defense after Secretary of Defense tell us, and Air Force leaders and others, that we should not depend on that, that should not be the crux of our policy, and to move toward that would be in their view destabilizing over a period of time if that were our real policy.

At least that is my recollection of what I have heard over the last 12 years. It sounds an awful lot to me as though we are moving off of that and we are now basically moving toward the launch-under-attack policy.

Is that a correct perception or am I hearing things that are not really there?

General DAVIS. Senator, and I appreciate the welcome, and it has to do, as you know, over that same 12 years with retaliation and the definition of retaliation. We are not talking about a launch on warning, but how much of an attack one has to be under before one retaliates.

To give the exact answer to that is virtually impossible because a number of scenarios are different. But that in my lexicon is retaliation.

Senator NUNN. It has always been an option. This is not something new. We have always reserved unto ourselves the right, when we were absolutely certain an attack was underway, to not foreclose that option.

But we have had, again, testimony over and over again that if we move to that as a policy, if that becomes our basic policy as opposed to one possible option and under certain conditions, then we have indeed moved to a destabilizing position.

So, my real question is, General Davis: Have we moved to launch under attack as a policy?

It seems to me that the testimony I have heard this morning just in the last few minutes plus the building blocks of last year's testimony—it seems to me that we have some people saying that that is tantamount to a policy.

General DAVIS. Sir, not to quibble, our policy is retaliation. To precisely define exactly what retaliation is, I don't think is useful.

Senator NUNN. Of course, the Air Force for years came before this group and told us we had to have survivable ICBM's. We have had years and years of testimony that one of the reasons we had to have survivable ICBM's is so that we would not have to go to an expressed policy of launch on attack.

We now seem to have given much up on survivable ICBM's at least so far as deployment of MX is concerned, and it seems to me the very prophecy we were hearing several years ago is about to occur.

General DAVIS. Sir, we want systems that are as survivable as is possible in order to enhance our deterrent capability. That is what we have been striving for.

Now, to single point the survivability, and let us face it, when people are working to a single point solution, you say many, many things, I am not saying anybody was wrong in the past.

What I am trying to give you in this open part of the testimony is my view, based on some 35 years in this business, of a retaliatory capability and a credible deterrent force based on—I am trying to put in the context with that good judgment of prudence and conservatism on both our side and the Soviet side—the Soviet planner in answering to his hierarchy must absolutely worst case it.

He must give the U.S. side the best capability he can because that is the only way he can honestly answer what sort of U.S. response he is going to get.

LAUNCHING UNDER ATTACK

Senator NUNN. General Davis, how do you feel—forgetting policy for a minute—how do you feel about moving into an era where both sides have an expressed strategy of launching under attack and how do you feel about the Soviets' ability to carry that policy out without the possibility of mistaken attack?

How do their systems compare to ours? Does this give you any sense of unease that we move from a position of basing able to survive and retaliate to a position on both sides where it seems we are moving toward policies of launch-under-attack. I don't know whether they are or not—do you think the Soviets have a launch-under-attack policy?

And the second question is how do you feel about moving into an era of both sides having it?

General DAVIS. Our first policy is and should continue to be deterrence. During the same period we should look at the research certainly on the strategic defense initiative. But we should keep our retaliatory capability in the best possible shape we can, given certainly very real financial constraints and certainly real requirements for a conventional capability.

On the Soviet side we need to understand that the Soviets are going to have a military capability in order to pursue their own objectives and a quick look at the Soviets' history and where the Soviets have been with nuclear weapons and from the earliest Baruch plan days to the present, the building of that capability in order to pursue their own separate policies should inform us that the Soviets are going to continue to modernize their nuclear capability.

How likely are we to be attacked? I think the idea is very, very remote. I think the far more likely scenario is that they use that capability to pursue their other gains around the world.

Senator NUNN. Chairman Warner has asked me to state my basic premise and I will be glad to for the record as to where we were in the past.

Where we were in the past, as I understand the testimony of many different witnesses over 10 years, is that we would never give the Soviets the comfort of precluding the possibility that we might launch under an attack before targets were actually hit.

We have never given them that comfort. I agree with that policy, we never should. I agree we should worst case that. We have always strived for a strategic retaliatory capability that would not require us to launch under attack, that would permit us to ride out an attack and then retaliate with enough power to be able to have what we call true deterrence.

Now, what I am saying is that it seems to me that we have come off the old policy and we now are relying as almost the first option, if not policy, on planning to launch under attack.

I hope I am hearing wrong. I hope that is not where we are going because it seems to me that all the warnings we had about MX and land-based vulnerability, if we indeed now have moved to launch under attack because of not having land-based survivability and not planning to have it in the near term—it seems to me all the prophecies are about to come into fruition.

Again, I hope I am wrong. I would welcome anyone, Mr. Chairman, clarifying that for me. I am just telling you the way I am hearing it and the way I am recalling it over the last 10 or 12 years.

I was hoping this day wouldn't come when I would conclude that is our policy, but I am afraid that is what I am hearing.

General DAVIS. No, sir. If I conveyed that, it is wrong. There has been no policy change.

Senator WARNER. If I can clarify this.

When you say the Senator is concerned because he is hearing this, is it occasioned by this witness or other witnesses?

Senator NUNN. A combination. General Davis testified last year. We went into this last year. I have heard the dialog with the chairman. Again, I hope I can examine the record and I will look at General Davis' statement with care, but it seems to me that that is what we have been moving toward.

I heard other witnesses, not just General Davis, but others. It seems to me if we are not there, I hope somebody will clarify that we aren't there, that we really do have the capability of riding out an attack and not having as our only option to launch under attack.

I believe that if both sides are in that situation, we have moved into a world that is indeed much less stable according to all definitions of stability.

I have heard from expert witnesses a long time. Maybe General Davis would clarify that.

My time has expired.

General DAVIS. Sir, there has been no policy change. We embrace, as a matter of fact, I feel proud that I added to the Scowcroft Commission report which restated the U.S. position on the strategic triad and there has been no policy change, none whatever.

Senator WARNER. In a sense you are saying you have not received any new instructions from the Secretary of Defense?

General DAVIS. That is right.

Senator WARNER. You in turn as SAC Commander have not made recommendations to them different from what you have done in previous years or your predecessor?

General DAVIS. That is correct.

Senator WARNER. In contrast, however, it may be that our ability to have a greater degree of survivability under the existing scenario has not changed, namely retaliate under some attack mode because of the increased analysis of hardening, communications and the like?

General DAVIS. And warning, yes, sir. Those are the points that I made.

Senator WARNER. Senator Cohen?

Senator COHEN. Thank you, Mr. Chairman.

MX FORCING SOVIETS TO GO MOBILE

General, Secretary Orr testified in February that the MX takes the Soviet "silo-based weapons out of the virtual sanctuary they presently enjoy. The Soviets recognize this and are going mobile."

Secretary Weinberger testified last week that the MX "will encourage the Soviets to reduce their reliance on large heavily MIRV'd ICBM's."

Which do you believe is taking place? Is the MX forcing the Soviets to go mobile or is it giving them an incentive to reduce their reliance on large heavily MIRV'd ICBM's?

General DAVIS. Actually both, Senator Cohen, in terms of giving us an ability to go into that sanctuary, the Soviets have to say how best then to accommodate to that new U.S. capability, and part of that answer, and I think they are saying really the same thing, one is a smaller, mobile, single reentry vehicle type system.

Senator COHEN. The SS-X-24?

General DAVIS. It is an MX size. It will be both silo and mobile.

Senator COHEN. A smaller, less MIRV'd system?

General DAVIS. It is smaller than their SS-18 and SS-19, but it is MIRV'd. The SS-X-25 is small, mobile, and a single warhead.

Senator COHEN. So, they are actually doing both?

General DAVIS. Yes.

Senator COHEN. They are not reducing their reliance on heavily MIRV'd systems. The 24 is heavily MIRV'd, smaller than the SS-18 or SS-19, but nonetheless still a heavily MIRV'd system.

They are going with more MIRV'd and indeed more mobile, they are doing both?

General DAVIS. Yes, sir, so both are right.

Senator COHEN. Excuse me, both aren't right. Both may be wrong. If you take the statement they are going mobile, yes, some of them are going mobile. But some of them are going MIRV'd which contradicts the Secretary of Defense's statement saying it is going to force them to reduce their heavily MIRV'd ICBM's. That statement is not entirely accurate. As far as I can see, they are doing more of both.

The MX is forcing them to go mobile and they are also adding more MIRV'd systems.

General DAVIS. Yes, they are doing both. As I say, both statements are right.

SDI

Senator COHEN. If you were the chief of staff of the Soviet Union, what recommendation would you make for a ballistic missile deployment development in light of our desire to go to a SDI, a stragetic defense system? What would you do?

General DAVIS. First, I would have to assess the capability of such a system and then decide which way, what better way to counter such a system. But you would have to know how effective it was at the beginning.

Is it overcomeable and then prudence would dictate a way to survive at least a portion of your attacking force if that were possible.

Senator COHEN. Would you consider adding more offensive capability as one?

General DAVIS. That is always a consideration.

Senator COHEN. Would you consider putting maneuverable reentry vehicles as part of your system to evade the SDI?

General DAVIS. Again, all of those are worst case situations, certainly, that you might try.

Senator COHEN. A first case situation.

General DAVIS. I say worst case.

Senator COHEN. I am saying first case situation.

General DAVIS. Not necessarily unless you know what it is you are trying to combat.

Senator COHEN. It seems to me that it is our responsibility—if we think someone has developed a better defense capability—to develop a better mousetrap or missile, something capable of overcoming that particular defense.

General DAVIS. After one has determined how big the box is, yes.

Senator COHEN. For example, talking about a cruise missile system, if we were satisfied they had developed a defense against a cruise missile, I am sure we would try to come up with a better cruise missile.

General DAVIS. Yes.

Senator COHEN. Something capable of evading their detection capability?

General DAVIS. Yes.

Senator COHEN. I think the same logic would apply to them, I would assume?

General DAVIS. Yes.

MIDGETMAN

Senator COHEN. Could I ask you about the Midgetman?

Last year Secretary Orr testified that the missile is not a real challenge. I believe General Fornell's statement on page 8 states "we are now confident that we can build a 30,000-pound missile."

Do you still stand by that statement, General?

General DAVIS. The answer to that is at this point in time, yes.

Senator COHEN. I have heard some reports saying the 30,000-pound constraint is making that goal less achieveable.

General DAVIS. I don't think we can determine that yet.

General FORNELL. As you say, Senator, we are in the concept development phase. Currently we have high confidence that we can make the 30,000-pound weight restriction that was put in the authorization bill last year.

That was a technical challenge for us when we began the program, but I think now we have been able to achieve that capability and live within that weight restriction, still requiring the missile to perform its task, essentially a 6,000-mile mission with a thousand-pound payload.

But through high energy propellant development, nozzles, and work that has gone on in the last year and a half, we feel that we

can make the 30,000 and still achieve the performance requirements we have laid down.

Senator COHEN. General Davis, if I could ask you this question.

BALLISTIC MISSILE DEFENSE SYSTEM

Do you think it is inevitable that we will have to deploy a ballistic missile defense system?

General DAVIS. I think we should keep our options open to provide the best possible capability for the United States. If that is SDI or a point BMD, then I think we need to examine this and then make a decision on whether or not we need to do that.

Senator COHEN. The reason I ask you the question is that the report that the President sent to Congress this past Monday states: 'Because the Soviets will always try to improve their missile accuracies, to the point where even superhardened silos begin to become vulnerable, the importance of the SDI becomes more evident not to protect silos but to prevent Soviet missiles from reaching any of their targets."

This seems to be saying that the Soviets are always going to increase their accuracy even if we were going to super-harden silos.

If you accept that premise, then it seems to me that you have very little alternative but to try to construct some sort of ballistic missile defense or else accept the vulnerability of the land-based system.

General DAVIS. And/or accept the basis on which the deterrence over the almost 40 years has served our national purposes.

Senator COHEN. One final point.

LIMITED FIRST-STRIKE CAPABILITY

What is a limited first-strike capability?

General DAVIS. I don't know.

Senator COHEN. I don't know either. Secretary Weinberger testified before the subcommittee that "by building a limited first-strike capability in their SS-18 and SS-19 force the Soviet leadership has sought to develop the ability to preempt the U.S. retaliation."

I would like to know if you are aware of what a limited first-strike capability is?

General DAVIS. When I said I don't know, just the descriptor limited first-strike capability is not enough for me to operate with.

In closed hearing I will be happy to describe what that would look like against the U.S. capability, Senator.

Senator COHEN. In open session you don't feel you can discuss it?

General DAVIS. And do it intelligently, no, sir.

Senator COHEN. We will wait for the closed session.

Thank you.

Senator WARNER. Mr. Exon?

Senator EXON. Thank you, Mr. Chairman.

General Davis and General Fornell, welcome this morning. Although we are on ICBM's, I would like to digress for just a moment.

PAVE MINT

As General Davis knows, last year several of us responded to his request to get the Pave Mint improvement in place in the budget. Since you were the instigator of that, General, could you give us a brief report and tell me how that program is coming along.

Is it pretty much to your satisfaction?

General DAVIS. Yes, sir, Pave Mint for the benefit of the other members of the subcommittee, is an improved electronic countermeasures capability for B–52G's.

Senator EXON. General Davis, according to Secretary Weinberger's annual report to the Congress, recent subscale tests suggest that the silos can be made many times harder than was formerly believed possible.

Since I know you follow that very closely, how much harder can we make our silos? What is the relative cost? Would it be your recommendation at this juncture that if we deploy 100 MX's that we also harden all the silos, some of them or not superharden?

General DAVIS. Sir, let me give you, from an operational commander's point of view, my view and then I will ask General Fornell to go into the specifics and technicalities of the scale testing because where we are right now is in the scale testing program.

Certainly the hardness technology is well worth pursuing. In the case of MX and in case of deploying MX, I need that military capability as soon as I can possibly get it.

The order to slow down and go through the proper environmental issues, the treaty issues, if we have a problem there and with what we know about the silos at Francis E. Warren, my view is that we should proceed with the deployment in existing silos.

Now, we should recognize that indeed we should continue to pursue the hardening and we are continuing to do that.

As far as dollars, what it would cost if a decision were made to replace those silos at Francis E. Warren, and if you could afford the time to do that, I don't think we have a good handle on what the costs are.

But as the operational commander who needs the additional deterrent capability that MX provides, its accuracy and its capability, and we need it as soon as possible, there is an urgent military requirement for it.

So, based on that, we plan to deploy the hundred MX's in existing Minuteman silos.

Now, for the dollars and the technicalities, where we are at on scale testing, General Fornell can provide that.

Senator EXON. Just to clarify this in my mind, suppose, General, we were going to proceed with the deployment of 100 MX missiles. From a military perspective, if we were going to make 25 of those 100 hardened, would the strategy be to have 1 or 2 hardened silos in every group of 10 or would you prefer as an operational commander to have separate flights of the nonhardened silos and hardened silo missiles?

General DAVIS. There are certainly pros and cons both ways, Senator, as I am sure you recognize.

In order to give you a definitive answer, I have to take a look at doing it both ways to see which is the better way to do it because

there is a cost factor involved, but more importantly there is a survivability factor involved.

Senator EXON. You have not made that determination yet?

General DAVIS. No, sir.

Senator EXON. Thank you.

General Fornell?

STATEMENT OF BRIG. GEN. GORDON E. FORNELL, U.S. AIR FORCE, SPECIAL ASSISTANT FOR ICBM MODERNIZATION, DEPUTY CHIEF OF STAFF, RESEARCH, DEVELOPMENT AND ACQUISITION

General FORNELL. Senator Exon, maybe a little overview. I plan on briefing a little bit this afternoon on the subject of hardness, but to give you a sense of where we are, we have continued our basing technology program which focuses on the basing technologies primarily in the hardness issue.

BASING TECHNOLOGIES

We have an ongoing program in a joint plan with the Defense Nuclear Agency and the Air Force to perform these tests.

The Defense Nuclear Agency is primarily responsible for the physics of hardening which concentrates on the very important scaling effects, the geology effects as they relate to the size of craters which have a bearing on silo hardness and the nuclear effects of our early aboveground tests, back in the 1950's.

The Air Force is examining the system as far as the cost, the technical hardness we could achieve, and, of course, an evaluation to assure we are not paying 90 percent of the money for an improvement of only 10 percent of the hardness. We want to collect the data necessary to build a cost-effectiveness curve, to find out where the most effectiveness would be.

We are currently achieving in the neighborhood of 20 times current hardness in scale tests. That program continues in a logical and prudent way and a much larger scale test is coming up soon, but in the testimony this afternoon I can show you some of that activity as well.

Senator EXON. General Davis, let me ask you a "what if" question.

DEPLOYMENT OF MX MISSILES

We are presently planning to deploy a hundred MX missiles. We will have them in place hopefully by what time?

General DAVIS. 1989.

Senator EXON. How much do you think we would be risking if we were to extend that out to where we would deploy 10 of these missiles a year and run that up to 1994 or 1995 for a completion date? String it out, in other words.

General DAVIS. I think the risk to deterrence—there is a certain amount of pluses that you get from a decision to deploy—the risk to deterrence to string it out over a 10 year period versus a 3½- to 4-year period, I think, is great.

The risk to commitment, and importantly risk to commitment on our part as concerns the arms control talks, I think is significant.

My answer is that I don't think that would be a good way to do it.

Senator EXON. You think from a bargaining standpoint that stringing out the deployment would be significantly less effective than completion by 1989?

General DAVIS. Of course, I don't agree that it is a bargaining chip to begin with. It is a significant military capability that we need. The sooner we can get it, the better, within reason.

So, stretching it out over 10 years is not the operational way to do it.

Senator EXON. One last question.

TITAN MISSILE

General Davis, you know well that I am the last and, I guess, the only defender of the Titan. I believe the chairman would be shocked if I did not ask a question about it.

Senator WARNER. Let the record show it has been 7 consecutive years.

Senator EXON. How many of the Titans are left and when will all of them be gone?

General DAVIS. They will all be gone in midcalendar year 1987. We are down to 29.

Senator EXON. You have 29 in place?

General DAVIS. Yes.

Senator EXON. Thank you, General.

Senator WARNER. If the Chair may address the members, it is my hope that we can have an executive session prior to terminating this hearing out of respect for the Prime Minister of Italy and the joint session.

I don't want to deprive my colleagues of their 10 minutes. That would be 10:30. It would please the Chair to the extent that the remaining members could curtail that 10 minute limitation. It would be appreciated. That time will be added on to the executive session.

Senator Glenn, you were here first this morning. I apologize.

Senator GLENN. Thank you, Mr. Chairman.

General, I thought perhaps we could come up with a system that would make everybody happy, build the mobile and put it in silos for those still hot for silos. I don't say that entirely in jest either.

If we watch Soviet progress, the SS-17's, SS-18's, SS-19's are strictly silos. You go to the SS-20, it is a mobile. You add one stage to it, it becomes an ICBM. They are going to the SS-24 which is silo first, mobile next. They are going to the SS-25 which is strictly mobile.

Now, from your own war games, when we throw the mobility factor in, it is a big complicating factor because they don't know where to shoot. As you know from our previous discussions on this subject, I have been a proponent of mobile for a long time.

I think what we saw with regard to the MX and the racetrack pattern was an attempt at mobility. It boggles my mind that we are going ahead with the MX. You say it is important and the President makes it the linchpin of everything to do with the missiles practically.

To me, if you don't know where to shoot to hit something, that is by far the best guarantee of a deterrent capability for this Nation of ours.

Now, you have a couple of things that are against that. One is that they say it is less accurate, but our accuracies now are getting down to the point where the capability of our warheads is getting rather academic as to what we can hit with a mobile and what we can hit with something out of a silo. They are getting down to insignificant differences, as a matter of fact.

As far as the number of warheads, which is the other point that always comes up, all of our people tell us that we can have at least three on a mobile if we want to design it that way right now and probably stay within that 30,000-pound limit or close to it, certainly within acceptable limits to it.

To me, the way to go has always been if you don't know where to shoot, you don't know where to aim, and if that thing can be moved out there and can have the accuracy, or close to it, then the way to go has always been mobile.

We had an amendment of mine approved 2 years ago to get people moving on the mobile. I am glad that program is coming along, but I just have not agreed with some of the program aspects at all.

I think the mobile is the way to go. The IOC's for MX and mobile are only about 2 years apart. I am sure that even that can be compressed somewhat. We are talking about the early nineties.

We have had some people tell us if we went to an accelerated program, we could probably have a mobile within this decade. The MX also could be perhaps moved ahead a little on a real crash program.

Why isn't a mobile a better deterrent at cheaper cost and more guaranteed survivability?

General DAVIS. First, the IOC is a little more than 2 years. We are talking about an IOC of MX for 1986 and an IOC for the small mobile ICBM in 1992.

Senator GLENN. It is flexible?

General DAVIS. We play Washington math. We equate IOC's to FOC's, depending on your perspective.

Let us take the argument a piece at a time. What is the principal focus of the threat today and what is the principal focus of the threat in 1990?

The principal focus of those two threats, the principal focus, and mobility is a part of it, but it is the fixed target base establishment.

Now, indeed mobility is part of the wave of the future, no question about that. But we cannot get in a position of letting the mobile tail wag the fixed dog. That is a fact.

One looks at the target base, one looks at principally a fixed target base. Mobility is important. My job and my job in advising this committee and advising the Secretary of Defense and the President is not the threat as we see it today, and in the threat as we see it today there is indeed a mobile part and that is a very difficult problem.

But the larger problem is the fixed problem and the way to get at the fixed problem most quickly is through deployment of that MX.

Senator GLENN. Fixed problem on their side or our side?

General DAVIS. Our side. We are talking about deploying an MX to do a deterrent job and its task is against a fixed target base because that is the lion's share of the target base that the United States would retaliate against. It is principally a fixed target base.

Now, it will go mobile certainly and we are, as you know, thinking about and working on that mightily. How does one get at that mobile target base? There are ways to do it, ways that I wish we had today, but we certainly aren't there yet.

Today's task and the thing we are discussing today that promotes deterrence, that is the job CINCSAC will have to do today and will have to do for the next 10 years, he needs an MX to do that job. He needs all he can get to do that job. Sequentially, he needs the MX to do that job.

Senator GLENN. He is not working alone, though?

General DAVIS. No, sir.

BALLISTIC MISSILES IN SUBMARINES

Senator GLENN. We have 53 percent of our ballistic missiles in submarines. They have not quite the same accuracy, but they are not too horrible either.

General DAVIS. No, that is right. There is no one more cognizant of what is in the triad than I am. As one looks at it on a dynamic basis the way one gets at what the Soviets have, the centerpiece of their military capability, and I think you will agree, is in the SS-17's, SS-18's, and SS-19's, that is where it is today.

How one gets at that principally is with ICBM and bomber delivered weapons principally.

Senator GLENN. I don't want to spend all my time on this. Since we have discussed this before in some detail. I still think the mobile is the way to go. It gives better deterrence at cheaper cost.

I think they are far more survivable. I think, any U.S. President is going to be hard pressed to launch on warning unless it is an absolute all-out attack.

General DAVIS. Sir, I don't disagree with the critical importance of mobility. I don't. I am talking about the task I have today and the task as I see it over the next 4 to 5 years.

Senator GLENN. In a couple of other areas, very briefly.

B-1

On the B-1, how is the conventional weapons capability coming along on that?

I have always thought the Air Force presented the B-1 in an absolute backward manner for the importance I think the B-1 has.

I talked to you about this last summer. The B-1 is always presented as a penetrator to Moscow and we base everything on that. If we get down to penetrating Moscow with nuclear weapons on a B-1, we will already have been firing everything else at that point. I think the likelihood of its being used in that scenario is remote.

We need a follow-on for the B-52 for conventional warfare so that we never reach that nuclear threshold. The emphasis has always been on its nuclear capability. We had to push hard some

years ago to even get the bomb bay configuration, and so on, for conventional weaponry.

How is that coming along? Is it developing well?

General DAVIS. Yes, sir, it is developing very well. It will be the first strategic bomber of the modern nuclear bombers we have ever built from scratch with a significant conventional capability.

That is bomb bays to carry 84 conventional weapons and interconnections and electrical modifications to accommodate conventional weaponry.

I am very proud of that.

Senator GLENN. You mentioned the B-1 here, of course, and its penetrating capacity, and so on. You even mentioned the conventional warfare capability of it in your statement. I hope we emphasize that it is an airplane that will carry roughly the bomb load of the B-52 and carry to a far greater range.

To me, that is the reason we have the B-1. The nuclear capability comes as a freebie in addition to the ICBM's and other capabilities we have.

That may not square with the Air Force view of the airplane, but it is mine and it is the basic reason I support it. If we lose the conventional capability, my support for the B-1 would be hard pressed, I am afraid.

General DAVIS. I am a great proponent of conventional capability. Based on the feeling we have dropped conventional weaponry from our strategic bombers, period.

Senator GLENN. The cruise missile capability which you mentioned in your statement here, I am very interested in that. I think we have gotten around to talking star wars and SDI. By the time we get the START talks done, the whole thing may be out of date if the cruise missiles come along as fast as I think they can come along and their ranges increase. Their capability is the wave of the future.

What is the status of the cruise missile development?

General DAVIS. We are in excellent shape on our cruise missile capability. We are equipping our last two wings with cruise missiles now and our advanced——

Senator GLENN. How are we doing on range?

Maybe you can't explain it in open session.

If we could make a breakthrough in range capability with our onboard computer, it is mind boggling what we could do with them if we could get additional range on these things, whether submarine launched, ground launched, or air launched.

General DAVIS. We are indeed doing well.

Senator GLENN. Can you give us any figures?

General DAVIS. I will have to answer that in closed session.

Senator GLENN. Thank you, Mr. Chairman.

Senator WARNER. Mr. Wilson?

Senator WILSON. Thank you very much, Mr. Chairman.

General Davis, as the Commander in Chief of SAC, you are the Nation's senior operational commander of our strategic nuclear forces.

SINGLE ADVANCED BALLISTIC MISSILES

In your professional opinion, should the United States rely upon single advanced ballistic missiles as our chief land-based deterrent for the rest of this century and very likely the first part of the next century?

And should that be a single warhead ballistic missile which is presently, and I will be happy to pursue this with General Fornell, solely constrained as to preclude the inclusion of penetration aids?

General DAVIS. The answer is it should not depend on the single. Of course, the President's whole program and, of course, the centerpiece of our Strategic Modernization Program has been MX or Peacekeeper.

That program we have been debating for over 12 years while the Soviets have been at work deploying a whole fourth generation system of ICBM's and beginning next year deploying their fifth generation of systems.

We should deploy the MX and then sequentially deploy the small ICBM.

Senator WILSON. I asked the question for the obvious reason that I hear a number of my colleagues saying that they have great discomfort about MX because it lacks viability and their response on providing the triad with a ground-based deterrent as one of the three legs is to go to a mobile missile.

The concept of mobility is attractive, but I note in your statement you say:

> In my opinion, nothing could be more detrimental to our efforts to address deterrent strategic imbalance than canceling MX and concentrating our efforts on developing and deploying small nuclear missiles.

Later in the statement you indicate that you think without the incentive you won't secure the kind of progress in arms control negotiations that we are seeking.

Now, I happen to agree and one of the questions that I have relates to the cost of the small missile. Assuming that it is deployed in a mobile basing mode, what are the costs of deployment in providing security?

What are the manning requirements and the cost of those requirements on an annual basis?

General DAVIS. Of course, one of the things that is still evolving in the program, Senator, is the exact operational concept that will be used in the mobile mode, how we will deploy it for survivability on a day-to-day basis, and the manpower attendant thereto.

Then how we will deploy or scatter in a contingency and the manpower requirements will be, of course, significantly less. We hope forever our state will be one of a peacetime state.

The exact manpower is yet to be determined. We are trying to use as much automation or as many sensors as we can in lieu of using very expensive manpower.

So, we don't have the exact manpower requirement. We have not determined that yet. I can ask General Fornell. I don't believe we have any good estimate yet, do we?

General FORNELL. We are examining a number of options and it is driven, of course, by basing mode very much. It is driven by our operational concepts that we are evaluating. We are currently eval-

uating a series of options and numbers from 250 missiles to about 1,000 missiles in our early estimates.

But as General Davis indicates, we are trying to develop innovative techniques to drive down the manpower intensity because, as you recognize, the manpower intensity for security, surety, and safety requirements with a nuclear system is very heavy.

For deployment of 500 missiles I think the figure was around the $44 billion mark in 1982 dollars. We are at the very early stage, about a year and a half, into a program of concept development and that is an area we are concentrating on and trying to get those answers to support the follow-on full-scale development decisions we anticipate during the latter part of 1986.

Senator WILSON. Did you say your first cut at it is $44 million?

General FORNELL. $44 billion. That is for full life-cycle cost and a rough order of magnitude for a force deployment of about 500 missiles.

Senator WILSON. When you say full life cost, are you talking about operational cost?

General FORNELL. Yes, sir. The acquisition which includes development, procurement and also the operational cost for about 15 years, sir.

Senator WILSON. I think, Mr. Chairman, that we need to pursue that in as great a depth as we can, given the stated limitations that you really won't know about until 1986 and you are predicating a great deal of this on hopes about what can be achieved through automation and sensors.

I would suggest that the short answer, and I in no way suggest that you not be entirely candid, because you have, what we infer is that you have some idea, but can't at all be sure.

But what we can be sure of is that the costs are far greater than they would be with a stationary system. That, I think, we understand.

Let me pursue this a little bit further.

I also hear the suggestion that because we haven't pursued hardening yet, that silos being stationary offer little hope of survivability and that seems predicated on the thought that we are going to absorb the full hit, that we are going to simply turn the other cheek and allow 10,000 Soviet RV's to rain down on us.

How reliable is the system by which we detect a full attack upon those silos?

General DAVIS. Very reliable.

Senator WILSON. I take it that is not required that we absorb the full hit before we know that we are being confronted by a massive attack?

General DAVIS. That, of course, is difficult to answer since that decision would be made by the President or his successor. Our policy is one of retaliation.

Senator WILSON. I would suggest that no American President is going to be geared to press the button.

On the other hand, if it is clear the silos are under a massive attack, I think it is inconceivable that he wouldn't try to get them off so as to prevent Soviet deployment against other legs of that triad.

For that reason, the idea that because they are not sufficiently hardened silos and we should not deploy them does not make a good deal of sense.

Let me ask you whether or not you think the concept of deploying a defensive technology around our counterforce can significantly enhance its survivability.

General DAVIS. I believe certainly the research program on SDI should go forward. Since we don't know yet the total effectiveness of such a system, I think the decision on whether or not it is sequentially deployed is a decision that is going to have to be left to the future.

We have some level of experience with the so-called safeguard system. Indeed, our ballistic missile defense system that was anticipated for deployment at Grand Forks, was abandoned, I believe principally on the premise that it could be overwhelmed, but I think as we work through the whole SDI research, decisions will have to be forthcoming as to the efficacy of various deployments attendant thereto and I simply don't know enough, I don't think anybody knows enough at this time, to make a very informed judgment on that part of the issue.

Senator WARNER. I think that concludes your time.

Senator WILSON. Thank you, Mr. Chairman.

Senator Levin?

Senator LEVIN. Thank you, Mr. Chairman.

Senator NUNN. Would Senator Levin yield for 1 minute on that last point?

LAUNCH ON WARNING

I just want to read a couple of quotes to show you, General Davis, what my memory is on this whole subject. It is not something new that has just come up. This is from a book called "Strategic Options in the Early Eighties, What Can Be Done," by Van Cleave.

On page 144, Van Cleave:

> The problem is that launch on warning is seen by some as easily a certain state of mind, a vulnerability problem and as rationalization for not doing anything. In that sense it is not a quick fix or answer to a problem, in my view, and I would hope we do not lend support to those who pretend it is. In any case, it is most questionable.

T.K. Jones, same page:

> We have done some analysis of launch on warning, assuming the Russians would launch if we did. We have found we are really worse off if both sides do it.

Paul Nitze:

> At the time I think the main drive behind launch on warning is to maintain deterrence through words rather than through maintenance of capable and flexible strategic forces.

Then, I think it is Dr. William Graham:

> No one is able to develop a satisfactory ICBM launch on warning plan. To do so may require more time and effort.

This is in 1978, but this is where a lot of us have been coming from on the whole ICBM problem. That is why it is so hard for us to shift gears.

General DAVIS. If I may, we weren't talking about launch on warning. We were not talking about that at all. You were talking about launch under attack.

Senator NUNN. The difference is very, very nebulous.

General DAVIS. It is significant.

Senator NUNN. I have been through that.

General DAVIS. It is significant, Senator.

Senator NUNN. To most people when you say launch under warning, you mean warning you are certain of.

Senator WILSON. The distinction that General Davis has made is not nebulous. That is precisely the point.

There is a difference between knowing that you have been hit and receiving some word that there may be an attack underway. I think what we have been discussing is launch under attack when you have already sustained injury.

The question is: Are you going to sustain full injury or are you going to do what you can to minimize?

Senator NUNN. If that is the definition, you and I are not far apart. If you have been hit, the vulnerability problem is already there.

General DAVIS. Yes, sir, that is what I was talking about, not launch on warning.

Senator WARNER. It would be helpful for the record if you state right now the definition you use for launch on warning and launch under attack.

General DAVIS. The definition, and, of course, it is not in my lexicon, launch on warning, I can't launch in any case until the President of the United States orders such a move.

Senator NUNN. I understand that.

On page 7 of your testimony, General, you say and I quote:

> While survivability is certainly a vital concern, the essence of deterrence is capability, not vulnerability. The whole question of a "window of vulnerability" that was raised some years ago did not relate specifically to the vulnerability of missile silos. Instead, it had to do with the Soviet strategic nuclear forces overtaking and surpassing U.S. capability.

General DAVIS. Yes, sir.

Senator NUNN. I fundamentally disagree with that, first.

VULNERABILITY

Second, when you are not worried about vulnerability any more, you have to ask why.

The only logical explanation is that we are not depending on having anything there when they arrive.

General DAVIS. I have never stated that vulnerability is not a concern. It certainly is.

I think we walked away from the whole window of vulnerability which had to do with our capability vis-a-vis his.

Vulnerability of land-based ICBM's and land-based silos was certainly a part of that vulnerability. I know that better than anyone.

What I am saying is that it is not a launch on warning. The better descriptor is you launch after you have been attacked, under attack. All those are semantical, but you are having nuclear detonations on U.S. soil.

Senator NUNN. If you are talking about after we have had detonations, that is a totally different case.

General DAVIS. That is what I am talking about.

Senator NUNN. I am relieved. I still say there are a number of statements, not just this witness, but many others, that indicate to me when you no longer say ICBM vulnerability is the problem and you say the whole question of window of vulnerability that was raised several years ago did not relate specifically to vulnerability of ICBM missile silos, it does pose a very clear question.

Senator WARNER. We have our distinguished ranking minority members here, Mr. Hart and Mr. Levin.

Would you gentlemen decide who is to be next?

RETALIATION

Senator LEVIN. Mr. Chairman, to get to the general on the point he raised, some questions relative to the policy of retaliation which we have described as a basis of our deterrence on which I fully agree with him.

Would you agree that we are not willing to have our retaliatory nuclear forces rendered obsolete by a Soviet ballistic missile defense?

General DAVIS. We have to factor that into the equation, yes, sir. But we also have an antiballistic missile threat.

Senator LEVIN. Would we be willing to stand by and watch our missiles become obsolete as a result of deployment by the Soviets of a ballistic missile defense?

General DAVIS. I am not sure that in the circumstance that would really be quite the case.

Senator LEVIN. Are you saying we are not willing or we are willing?

General DAVIS. I am saying perhaps——

Senator LEVIN. Perhaps we are willing to have our retaliatory offensive missiles rendered obsolete?

Are you saying you might be willing to do that?

General DAVIS. I did not say that at all.

Senator LEVIN. I thought you said you might be.

General DAVIS. I said I don't know whether we would be willing to stand by. I am trying to get at what you are asking.

Senator LEVIN. If we saw the Soviets deploy a ballistic missile defense, would we stand by and watch them deploy that even though it rendered our offensive missiles obsolete?

General DAVIS. Is this a breakout by the Soviet Union? In this theory have they broken out of the ABM Treaty? Is that what you are saying?

Senator LEVIN. Yes.

General DAVIS. I think that raises a whole order of things that go well beyond the deployment of ballistic missiles.

Senator LEVIN. It sure does. My question relates to you and your position.

Would you be willing to watch that happen without taking countermeasures against that ballistic missile defense?

General DAVIS. I think the country should be concerned and I think the whole ABM Treaty deals with that.

Senator LEVIN. General, let me try it another way.

COUNTERMEASURES AGAINST A SOVIET BMD

Are we presently working on countermeasures against a Soviet ballistic missile defense?

General DAVIS. Certainly.

Senator LEVIN. We have money in the budget?

General DAVIS. Yes, sir.

Senator LEVIN. Can you identify where in the budget that money is and what countermeasures we are working on?

General DAVIS. I can identify the money. The details of it are partially classified, but it is in the advanced strategic missiles part of the budget.

Senator LEVIN. On how many different countermeasures are we working?

General DAVIS. I think that part is classified. The number perhaps may not be.

Senator LEVIN. Can you tell us the number?

General DAVIS. I don't know the number, Senator.

Senator LEVIN. Is it more than one?

General DAVIS. I don't know. Perhaps we can provide that for the classified record.

Senator LEVIN. You are saying the number is classified?

General DAVIS. I don't know whether the number is classified.

Senator LEVIN. You know the number, but you are not sure whether it is classified?

General DAVIS. I don't know the number exactly.

Senator LEVIN. Why are we working on countermeasures against the Soviet ballistic missile defense if we hope that both sides will end up with it?

General DAVIS. The Soviet Union, as is well known, has a ballistic missile defense around Moscow. Prudence dictates that there may be military objectives around Moscow that we would like to get our ICBM's through.

Senator LEVIN. Are we also working on countermeasures to a Soviet strategic defense initiative type of BMD?

General DAVIS. One could surmise that perhaps you connect the existing BMD to a SDI type.

Senator LEVIN. Are we working on countermeasures to an SDI type of BMD?

General DAVIS. We are working on countermeasures to the existing ballistic missile system.

Senator LEVIN. We are not now spending money researching countermeasures to an SDI type of BMD?

General DAVIS. I guess then, as you lead me through these questions, then the question becomes, is the existing ballistic system around Moscow capable of being part of the Soviet SDI?

And I don't know the answer to that question.

Senator LEVIN. I am talking about the SDI type of BMD that the President has defined and described.

Are we working on countermeasures?

General DAVIS. I don't know.

Senator LEVIN. Are we working on countermeasures to space-based defense?

General DAVIS. I don't know.

Senator LEVIN. Who would know?

General DAVIS. I am sure the Assistant Secretary of Defense for Research and Engineering perhaps would.

Senator LEVIN. Should we be working on those countermeasures?

General DAVIS. That is not my line of work, Senator.

Senator LEVIN. Do you agree with General Scowcroft, and I am quoting:

As a practical matter, it would be very difficult to induce the Soviets to reduce their offensive forces if they are faced with the prospect of a strategic defense for which they might need those offensive forces to penetrate.

General DAVIS. I have to examine that in some detail, Senator.

Senator LEVIN. Would you give us that for the record?

General DAVIS. Certainly.

[The information follows:]

REDUCING OFFENSIVE FORCES WITH DEFENSE

As a practical matter, it has always proven difficult to induce the Soviets to reduce their offensive arsenal. Over the years, the Soviets have continued to build their forces regardless of U.S. restraints. However, the President's Strategic Defense Initiative is a research program extending across potential technologies against all phases of a ballistic missile's flight profile. Should this initiative go beyond the research phase and produce an effective defense against ballistic missiles, the Soviets might well choose to reduce their reliance on those forces.

Senator LEVIN. Would you agree with General Scowcroft:

The Soviets have been abiding by the SALT II limits. It seems to me it is in our interest to do so as well.

SALT II LIMITATIONS

General DAVIS. I think we should certainly keep our options open there. We are continuing today to abide by the SALT II limitations, but since that is a Presidential decision, I think the President has to make that decision at some time in the future.

Senator LEVIN. Would you recommend to the President it is in our interest to abide by the SALT II limitations?

General DAVIS. When decision time comes, I would have to assess the situation at that time before I made a recommendation.

Senator LEVIN. You have not made the assessment yet?

General DAVIS. Because it is not decision time yet.

Senator LEVIN. But you have not made that assessment?

General DAVIS. I have made that assessment privately today that we should continue to abide by the SALT II limitations—today.

Senator LEVIN. That is helpful.

If the Soviet Union deployed a space defense of the type that the President described, would you recommend at that point that we deploy more RV's?

General DAVIS. Prudence on my part would dictate that we should examine all of our alternatives.

First, we should determine how successful it is, what sort of significant threat, if any, it would pose, and then prudence would dictate a recommendation as to ways to counter such a system.

ABM TREATY OF 1972

Senator LEVIN. One other question about the Scowcroft Commission and I will yield.

Do you agree with the Scowcroft Commission that one of the most successful arms control agreements is the ABM Treaty of 1972?

General DAVIS. Yes, I would.

Senator LEVIN. Thank you.

Thank you, Mr. Chairman.

Senator WARNER. For purposes of planning, the Chair, after consultation with members, has decided we will adjourn at the conclusion of Mr. Hart's questions and resume the hearing at 12 noon in open session for a brief period and then go into executive session.

We will resume with this witness at 12 noon for a brief open session followed by executive session and then break for lunch and return at 2 p.m.

Senator NUNN. What is the schedule this afternoon?

Senator WARNER. We reconvene at 2 p.m.

Senator Hart?

Senator HART. General, let me read you a quote:

"I agree that there is vulnerability in the hardened silos. There is also the same vulnerability in the multiple shelters. It is as simple as this. What we are buying is some time while we try to narrow the window of vulnerability," et cetera.

The speaker at the time was President Ronald Reagan, October 16, 1981.

WINDOW OF VULNERABILITY

Now, I have been on this committee over 10 years and throughout the majority of those years I have heard what now amounts to reams of testimony, almost all of it from the supporters of MX. I can't remember a time when a witness used that phrase "window of vulnerability" when they weren't referring to our ICBM's, our land-based forces.

Now, your testimony this morning is the first time I have ever seen a witness in or out of uniform who has said that when the so-called window of vulnerability was raised in the past, by Ronald Reagan in 1980, among others——

General DAVIS. For the first time?

Senator HART. Among others. I didn't say for the first time. You are the first to say that when the issue was raised in the past, that it was not in reference to the vulnerability of missile silos.

That is exactly what people were talking about. I can't remember a witness until your testimony that said that wasn't what they were talking about.

What people were concerned about throughout the seventies and early eighties was the vulnerability of land-based ICBM's.

General DAVIS. When in the seventies?

Senator HART. Throughout the seventies.

General DAVIS. Does that include 1970?

Senator HART. It certainly includes from January 1975 when I joined this committee.

What I want to know is when did that get changed?

General DAVIS. When did what change?

Senator HART. When did the reference to the so-called window of vulnerability not refer to the vulnerability of missile silos?

General DAVIS. I believe from the outset. When one talked about a vulnerability, you remember, as I recall—maybe you don't remember—when we looked at a bathtub chart, the bathtub chart had to do with vulnerability and it had to do with a net minus on the part of the United States in a dynamic exchange.

Senator HART. That is called an imbalance of forces.

The concern, as I think you well know, throughout the second half of the seventies, which shaped the whole strategic debate in this country for the better part of a decade, certainly from the mid-seventies up until this time, was the vulnerability of the land-based missile.

That is what all that race track business was about. That is what the political debate in 1978, 1980, and 1982 was about. All I can tell you is as a member of this committee and hearing hours and hours of testimony that is what the testimony was about.

Until this morning I have never heard a witness from any administration claim that such was not the case.

General DAVIS. I have been before this subcommittee now for the past 3 out of the last 4 years. This is the first time I have seen you at hearings of the subcommittee.

In 1979 my predecessor, Gen. Richard Ellis, testified before this subcommittee and showed a chart on force imbalance and called it the window of vulnerability.

Senator HART. I guess that makes the difference then.

General DAVIS. That is just one.

Senator HART. By the way, whether I was or was not present I think is not the Air Force's concern.

General DAVIS. No, sir.

Senator HART. Could you tell the subcommittee what this sentence means.

> Improved and survivable warning systems that incorporate dual phenomenology provide for a more timely and assured attack definition.

What does that mean?

General DAVIS. That is our whole system of Defense Satellite Program, Warning Satellite Program and our whole set of warning sensors, space based and land based.

Senator HART. That is what the phrase dual phenomenology means?

General DAVIS. Yes, sir.

Senator HART. Finally, General, you use the word "prompt" three times on page 6 of your testimony, once in the context of "prompt, time urgent."

What is more prompt about the MX than the existing Minuteman?

General DAVIS. There is nothing more prompt about it. By prompt we are talking about its ability, its flight time and its launch ability to do the same. The two are the same.

Senator HART. As the Minuteman?

General DAVIS. Yes.

Senator HART. You state:

The only near-term solution to redress the present imbalance in prompt, time-urgent capability.

Down below you write:

. . . until we possess the prompt retaliatory capabilities. Let me emphasize on the need for a prompt, hard-target capability.

General DAVIS. Yes, sir.

Senator HART. What is prompt about MX that is not prompt about Minuteman?

General DAVIS. Prompt in the context of its capability against those fourth-generation ICBM's, SS–17, SS–18, and SS–19 in hard and superhard silos. You have a prompt capability today with Minuteman which has the best capability against those silos.

But MX will have a significantly improved capability that you don't possess with the yield-accuracy combination of today's Minuteman.

Senator HART. But it is not more prompt?

General DAVIS. It is not more prompt, no, it is capability.

Senator HART. So, we can strike the word prompt in each of these cases?

General DAVIS. No, because prompt is very, very important. Prompt has to do with MX.

Senator HART. Let me start all over again.

What degree of promptness does the MX system have that we do not presently possess, that you say we have a present imbalance in? imbalance in?

General DAVIS. We have a present imbalance in a prompt capability against the centerpiece of the Soviet strategic force, its land-based ICBM.

Senator HART. In what respect is our present capability not sufficiently prompt?

General DAVIS. In terms of its yield and accuracy and in terms of its flight time. As much as I can in open session, the problem with today's capability is our Minutemen don't possess the requisite accuracy-yield combination to give you a very high level of damage expectancy.

Senator HART. Thank you very much, sir.

Senator QUAYLE. Thank you, Mr. Hart.

The subcommittee will adjourn now.

Senator WILSON. Mr. Chairman, before we do, could I take 2 minutes to place something in the record?

LAUNCH UNDER ATTACK

Senator Nunn and others have been concerned with this definition of launch under attack. I wonder if I might ask General Davis if he agrees with this definition provided by the Scowcroft Comission on page 8.

The Commission said: "In such a case," and they are referring to Soviet submarine-launched missile attack, "the Soviets should have no confidence we should refrain from launching our ICBM's during the interval after we have been hit. It is important to appreciate this would not be a launch on warning or even a launch under attack, rather launch after attack after massive nuclear detonations had already occurred on United States soil."

General DAVIS. Certainly, I agree with that.

Senator WILSON. This, I would point out, Mr. Chairman, is essentially the same definition that I think Secretary Harold Brown was using when he testified before this subcommittee in June 1980 and said that he thought that it was advisable to keep the Soviets concerned that we would launch under attack and said to some extent that does provide a deterring effect.

Senator NUNN. Mr. Chairman, let me say for the record, too, I would agree with Senator Wilson on that. If we used these terms, we would be better off.

Launch after attack is a better definition than launch under attack. It is slightly different, but similar to launch under warning.

If you define launch under attack or after attack, you are really talking about being able to ride out; therefore, you get back to the vulnerability problem which we have been going around and around about.

I think definition is very important. I think having the option of launching even before being hit by detonations is important. I am not foreclosing that option.

The question is whether that is your primary option, or whether that is your last resort option?

What I am afraid is that we have shifted from its being something we might do, keeping open the possibility of that, to its becoming the front-burner option. That is the shift that I am talking about, not the question of whether we are ever going to do it.

If we have, indeed, shifted there, and I want to say to General Davis this is not the first time I have raised this question. I have raised it with other witnesses. I raised it in other contexts. I don't want anyone to say this is the first time you have heard this.

This is what we have been considering in the last 4 years when we got in the situation where we basically gave up on the survivable ICBM into the near term. This is not unique to this witness. He crystallized it this morning.

There is a lot of other discourse that indicates to me that we have moved the option in reverse and that now riding out appears more and more to be the last option instead of the first option.

Senator WILSON. Mr. Chairman, I would think we would also do well to define the term "riding out."

To me, it means one thing, to sustain a hit, and another to simply wait passively until you have sustained a full attack.

The idea that we ride out, if that means sustain a full attack, I think is not an acceptable option.

Senator HART. The first part of the definition he read said a hit and the last part of the definition said massive attack. So there is ambiguity even in that language.

Senator WARNER. Gentlemen, I thank the members of the subcommittee for their forbearance here. We will resume at 12 o'clock noon.

[Recess.]

HEARING RESUMED

Senator WARNER. The subcommittee will resume its hearing in open session.

Gentlemen, it was the consensus of many, including yourselves, that it is wise to have another brief period in open session that we would focus now on definitions which are being used by SAC in its planning scenario.

I wonder if you might include those definitions?

General DAVIS. Certainly.

I know, Mr. Chairman, there was concern this morning as we talked about the issue of survivability, launch on warning, launch under attack, and vulnerability.

If I might, the whole basis in fact for the strategic forces, and I don't think there is any disagreement on this, is for deterrence.

Senator Wilson quite eloquently went through part of deterrence this morning on retaliation via the Scowcroft report. I happen to have been a contributor to that, at least having appeared before the Scowcroft Commission, and it is probably as well put together a document as any on the whole subject of strategic nuclear deterrence.

So, I would like to use two sentences that explain what I was trying to explain this morning.

First, the existence of several strategic forces, that is, the triad, requires the Soviets to solve a number of different problems in their efforts to plan how they might overcome them.

Our objective, after all, is to make their planning of any such attack as difficult as we can. The Soviet strategic planner must worst case it. We must make his task as difficult as we can.

Repeat, once again there has been no change in this Nation's policy, this Nation's deterrent policy, this Nation's policy with regard to strategic nuclear forces, and that is a retaliatory policy. There is no change in that.

When we try to define, all definitions are scenario dependent. To preclude us ever doing anything or to preclude up front stating what we will or won't do is, of course, not very useful because we again want to make the Soviets planning of any such attack as difficult as we can.

We have not changed our policy and it is the policy of retaliation.

Senator WARNER. I think that helps clear it up.

Let me see if I can provide a further clarification.

LAUNCH UNDER ATTACK

Senator Nunn raised the extremely important issue of whether our policy has shifted from launch under attack as an option that the Soviet planner must worry about to an option that the United States planner depends on.

It is my understanding of your testimony, as I listened this morning and now with this clarification, it is even more fully documented, that you, General Davis, really stated there has been no change in policy.

As I understand the testimony, what has changed are elements of the communication system, the warning network that enhance the deterrent value of our force in the eyes of the Soviet planner.

In other words, there is a further complication because of the technological enhancements?

General DAVIS. Yes, sir.

Senator WARNER. Of course, there is always the option that there is a policy of launch under attack.

My view is that your responsibility as SAC commander is to present the option to the decisionmaking branch of our Government?

General DAVIS. I present what I have observed and as I understand the situation as characterized by the best information at the time I present that information and then the policymaker makes the decision.

Senator WARNER. Now, again, for the record, the definitions of the various options that you plan by way of your responsibility in planning our retaliatory options; in other words, the various launches?

General DAVIS. Yes, sir. Other than to say our policy has not changed, but to talk about specific policy as regards response options, I believe is a matter for the classified session.

Senator WARNER. I understand that, but what are the definitions you use?

What is the launch under warning scenario, launch under attack and launch after attack?

How do you define those?

General DAVIS. Those are not defined that way. Those terms have been coined in various places, but what we have are specific attack options.

Senator WARNER. You mean retaliatory options?

General DAVIS. Retaliatory options that are dependent on the situation at the time. They are not preemptions, they are retaliatory options.

Senator WARNER. Then, of course, it is up to the policymaker to determine which to use?

General DAVIS. Yes, sir.

Senator WARNER. Senator Glenn, we are just about to wrap up this open session.

Senator GLENN. I am sorry I did not get back on time.

Senator WARNER. We just started. Perhaps the general will state once again those two key sentences.

General DAVIS. Yes, sir.

NUCLEAR RETALIATORY POLICY

As we are trying to clarify policy once more, Senator Glenn, the whole issue had to do with Senator Nunn's question this morning, have we changed our nuclear retaliatory policy.

The answer is "No, absolutely not." But I said I contributed by working with the Scowcroft Commission. I think the documentation they put out is probably as good as any I have ever seen.

I pointed out there are two key sentences that I found most useful when we are examining the strategic retaliatory forces:

> First, the existence of several strategic forces require the Soviets to solve a number of different problems in their efforts to plan how they might try to overcome them.
>
> Our objective, after all, is to make their planning of any such attack as difficult as we can.

I think those two sentences are the essence of the whole strategic triad and the whole efficacy of our strategic deterrent forces.

But I want to assure the subcommittee there has been no change in our strategic retaliatory policy.

Senator GLENN. Are we in closed session?

Senator WARNER. No, we are not. We are just about to close.

Senator GLENN. I have no further questions.

Senator WARNER. We will now go into executive session and the Chair will resume the hearing as soon as the room is properly cleared.

EXECUTIVE SESSION

Senator WARNER. The subcommittee will resume in executive session.

Again, General Davis, if you will lead off.

MAJOR ATTACK OPTIONS

General DAVIS. As you requested, we have major attack options——

Senator WARNER. Major retaliatory options?

General DAVIS. When I say major attack options, that is in the vernacular. They are retaliatory options. There are no preemption options. They are major retaliatory responses in [deleted.]

[Deleted.]

Then in response, in retaliatory response, based on what our warning systems—let's assume there is an attack by the Soviets, our warning systems will detect this first.

Then the safe assumption is that it is a coordinated attack, that is, with simultaneous arrival of weapons. If it is not, you get additional warning time, you get a tip, additional warning time.

Then the President's decision to retaliate is based on a [deleted] and all of this is occurring very quickly.

The President's decision is based on our recommendation to him. But in all of these options they are all retaliatory options.

Senator WARNER. You have heard the terms launch on warning, launch under attack, launch after attack.

How would you define them in closed session?

LAUNCH ON WARNING

General DAVIS. Launch on warning would say there is a massive attack underway; our sensor systems portray that. A massive attack, of course, comes from ICBM's, not that there aren't hundreds of SLBM's, there are, but the massive attack comes from ICBM's.

Then the BMEWS characterizes it and for submarines the PAVE PAWS system characterizes it after the overhead has detected that launch.

Then the clock starts. Then the decision, of course is based strictly on what they are after and then it gets down to whether or not the President makes a decision to respond, to retaliate, based on what the warning sensors indicate, based on the fact that attack is

imminent or is underway, and this is Gen. Bennie Davis talking and doing this for a long, long time, [deleted].

Now, launch on warning would be the launch based on what your warning systems give you before you come under attack.

Launch under attack is that you are under attack, you have had nuclear detonations.

Senator WARNER. Launch under attack is ride out?

General DAVIS. No, sir. [Deleted] depending on what the sequence of launch was. A ride out would mean you would ride out the entire first wave of SLBM's, ICBM's, and then perhaps you would even ride out the first wave of SLCM's when those come on line, and ALCM's from the bombers, a full ride-out scenario.

Senator WARNER. Senator Glenn, would you proceed. I will come back.

Senator GLENN. Thank you, Mr. Chairman. I have a couple of questions, General.

CEPS, UNITED STATES AND SOVIET MISSILES

Do you have figures with you on the CEP's of the various United States and Soviet missiles?

General DAVIS. Yes, sir. I can give them. I know most of them.

Senator GLENN. Just give us a brief rundown on that if you will—if you want to, you can give us a more complete record of that later—of all the different missiles and what you use in your planning for CEP's, ours versus theirs.

General DAVIS. Let me start with the ICBM's first. A series of, now a few remaining, Titan II's which are [deleted]. They are not effective against hard targets, but effective against Soviet soft area targets.

Senator GLENN. Accuracy of about?

General DAVIS. About [deleted].

Next are Minuteman II's with a [deleted]. They are nominally [deleted]. Even with [deleted] they don't give you very high damage expectancy against hard and superhard targets.

Now, let me characterize the target set that we are after. The target set we are after is principally that fourth generation of ICBM's, his SS-17's, SS-18's, and SS-19's, which are housed in silos [deleted].

In that system of ICBM's there are resident over 6,000 ICBM reentry vehicles that threaten the United States.

On our side we have something like 2,100 land-based ICBM reentry vehicles. I started marching through those. Minuteman II doesn't give you a very high damage expectancy against those hard and superhard silos.

There are also hard [deleted] military and leadership relocation centers.

Senator GLENN. What do you mean by relocation centers?

General DAVIS. Where the [deleted] military and leadership evacuate to.

Then we have Minuteman III, two variants. One with MK-12 and one with MK-12A warheads. They both have essentially the same accuracies now with [deleted].

When we finish the updates—that is, we are updating the guidance system—[deleted].

The Minuteman III with the [deleted] and it will give us, with the updated accuracy, [deleted].

Now, shifting to the third leg of the triad, the SLBM, which are principally resident in the C–3 and C–4 missiles, C–3 and C–4 are quite accurate. [Deleted.]

With that accuracy against the [deleted]. With the C–3 the probability of damage against a [deleted].

Now, that is existing equipment.

Now, with MX and D–5 which is the modernization program, [deleted].

With the D–5 it has an accuracy of [deleted]. That is the whole reason for MX and D–5, to give us the capability against those hard and superhard Soviet targets.

RANGE OF D–5 AND MX

Senator GLENN. What are the ranges on the D–5 and MX?

General DAVIS. MX is, of course, [deleted]. Of course, the other part of that is the point made this morning on promptness. You get MXs and Minutemen out in [deleted] after the launch order. On the boats that are [deleted].

Senator GLENN. [Deleted.]

General DAVIS. Yes, because of the fragility of the communications that they all get the launch directive.

Senator GLENN. Once they get the signal on board and ready to go, then what is their time off?

General DAVIS. [Deleted.]

Senator GLENN. From the time they get the signal on board?

General DAVIS. No, this is after they get the signal.

Senator GLENN The MX is what?

General DAVIS. [Deleted.]

Senator GLENN. If the D–5 was shore based, if it was land based, could it get off in the same speed as the MX?

General DAVIS. Sure, with the same kind of communications, yes.

Senator GLENN. I note the desire for the MX, in fact it came up in a discussion several days ago with several other Senators as to why we wouldn't save money going with the D–5 as opposed to the MX, make a land-based D–5?

General DAVIS. That was discussed when the MX was decided upon. We had to go back and revisit that decision.

As I recall, my history is not that good, but the decision was made to go with two different systems.

Senator GLENN. Is that so we have a backup or were there technical reasons? They have different capabilities basically?

General FORNELL. They did have different capabilities and during Dr. Brown's tenure as Secretary of Defense the Common Missile Program was evaluated, one missile to do both jobs, but the unique requirements that we have for land-based systems and the Navy has for sea-based systems drove to the equation that you would have a sea-based missile D–5 requirement versus the MX, the land-based requirement; two separate requirements and not

enough commonality, if you will, to make it cost effective to go with just one.

Senator GLENN. What are the differences we are talking about that drive it?

One is that there is a water environment, but that is something that if it was land fired wouldn't make any difference anyway.

General DAVIS. Senator Glenn, I don't recall the specifics. I know it did come up during our Scowcroft Commission debate and I can provide it for the record. So, I will give you the correct details.

Senator GLENN. I think it would be good to have it for the record, Mr. Chairman, because that may come up in the debate on the MX.

I would be surprised if there would be a move, not from me, but from some other people I have heard discussing this.

Senator WARNER. Perhaps General McCarthy who was very actively engaged in working on the Hill——

General DAVIS. Before we get to that, let me make sure I didn't confuse you.

A submarine launch is based on a commit time. The commit is [deleted].

Senator WARNER. And received?

General DAVIS. No. Once they get the message and decode it, let us say it was [deleted] how long does it take to physically launch the SLBM out of the boat? The answer to that is [deleted].

Senator GLENN. That is the reason I had a followup question. [Deleted] was longer than I had heard of.

General DAVIS. [Deleted] is for message transmission and to commit, to get them in range and commit.

Senator GLENN. If I am on the Trident out there and I am commanding that Trident and I get a message, I say OK "go," it will be [deleted] is that right?

General DAVIS. But you can't launch it. [Deleted.]

If your communication is working perfectly and you get it immediately, it takes you [deleted]. That is called the commit time.

Because the ranges vary where you are at for survivability, for a timing point, all the submarines, all the [deleted].

It is a characteristic of submarines.

Senator GLENN. This would be if you are lauanching a coordinated strike?

General DAVIS. Yes, sir. Retaliation is a coordinated strike.

Senator GLENN. What physically is the time required to get that thing out of the boat and get it going? Is that the [deleted].

General DAVIS. [Deleted.]

Senator GLENN. Without regard to communications?

If I am sitting off the cape down here someplace and I am deciding I will test one out here, from the time the command would go onboard the ship getting the hardware out of the ship would be [deleted]. Is that right?

General DAVIS. That is right.

Senator GLENN. That is the figure I was looking for.

General MCCARTHY. In response to your question, the response that General Fornell referred to was done to evaluate the D–5 for land-based systems to replace MX by the Department of Defense.

The basic difference is the environment in which the missile has to operate. The submarine missile is designed for a relatively benign environment. It has to launch out through the water and then fire, but in a relatively benign environment.

The land missile has to consider the potential of the nuclear environment around it, so the missile is much harder. It is designed with different capabilities, different guidance systems.

The conclusion of that study was that the cost of trying to modify a D–5 to put it in a land-based system exceeded the cost of proceeding with MX. So, that option was no longer considered by the Department of Defense.

General FORNELL. If I could supplement that also, the MX, of course, is here and now. I think that is the overriding consideration that meets the operational requirement. Flight tests have resulted in seven successful launches so far.

Initial operating capability, 10 missiles on alert by December 1986.

The D–5 is in concept development and planned for a first-boat deployment the latter part of 1989 and then at a rate of one submarine per year after that to modernize the sea-based leg of the triad.

So, the thrust of the Scowcroft Commission was to address the military effectiveness imbalance to deploy MX today to threaten those hardened Soviet targets and then for the future, hard target capability of the D–5.

MOBILE VERSUS FIXED-POINT MISSILE

Senator GLENN. On the Scowcroft Commission and the back door mobile discussion this morning a bit, the Scowcroft Commission and the Townes Commission before it, which I met with for 3 hours one day, there wasn't a single member on that panel that didn't feel that a mobile would be better as a deterrent because they wouldn't know where to shoot, except they felt Americans would never accept—the code word then was—the social interface.

We would never accept mobiles out where we could see them.

They felt is was a better deterrent and the only reason they weren't willing to recommend it was because of the uproar it would cause in this country, the social interface. We couldn't bear to have missiles on our beautiful interstate highway system. It would give a dispersion that is fantastic.

In Europe they can't even come close to it. That is one of the reasons I have been for it.

You stated a while ago that "our policy objective is to make their planning more difficult." Those were your exact words.

General DAVIS. Yes, sir.

Senator GLENN. I could not agree with you more. To me there is nothing that confounds the Soviet planner any more than a mobile as opposed to a fixed point missile.

I know what it does in our own war planning on this side. You put the mobility factor over there and it complicates our war making tremendously. That is one reason I have been for mobile and I think we should be going in that direction.

General DAVIS. The point I was trying to make this morning is that as we look at the target base, the mobility will loom larger. Today's force in terms of ICBM's has no mobile capability. They do indeed have SS–20's. As we look at the target base as 100 percent, the mobile part of that today is about [deleted]. In 1990 that will grow to about [deleted].

My point with MX is we need that today. There is no question about the future.

Senator GLENN. That seems to be our own point of contention here. The IOC of the MX is December 1986 which for all practical purposes is 1987.

I understand all the reasons why we say December 1986. Your FOC is 1989. Opposed to that, the mobile, and we have been told this could be moved up a year to 2 years, its IOC right now on paper is 1991. I don't know whether that is December or January. I presume that is December.

The FOC is 1993. If that could be moved forward, all we are talking about is 2 to 3 years, 3½ at the most here, before we have a very, very substantial capability with either one of them.

So, it is not all that far apart. I don't see that as being a time period that would prohibit going to the mobile.

General DAVIS. If I may, and on the development side General Fornell can comment on it also, but the development of the small ICBM, the schedule you see is a very success-oriented schedule.

MX AS BARGAINING CHIP

A lot of its success is based on what it has gotten out of MX, MX development, and MX production. I don't know who talked about a year and a half. I would bet money that General Fornell was not nearly that optimistic. But here we are going to the table in the middle of this month to negotiate and we are talking about once again, if we were to go that way, kicking the can down the street.

Senator GLENN. I know that the bargaining chip idea gets into this all the time. It is held out as a bargaining chip. I don't think it is much of a bargaining chip when we tell them it is a bargaining chip.

The first person who started talking about its being a bargaining chip let the system down.

The Soviets are more concerned about our actual capability that we are going to have. If we throw up a smokescreen on systems that we are willing to give away, they know we are willing to give them away. I never liked the idea that the MX is just a bargaining chip anyway.

The Soviets are far more likely to be deterred from any stupid action by knowing that we have an honest to God capability that can fight them right back if they are dumb enough to send something over here.

General DAVIS. Absolutely.

Senator GLENN. They also know, I think, that if they are going to shoot at the old Titan silos that they have to figure coordinates and for the last 20 years they have known where those were. The MX is an even more attractive target than what is in those old silos right now.

I don't think they would be half as concerned about that as they are about knowing that we have one tremendous response capability, but that they don't know where it is going to be. It may be behind a hill in Alabama, it may be behind a garage in Ohio someplace, it may be all over the place, and they can't possibly keep up with these things in a crisis situation.

Granted I think we can keep these on Federal lands, they are maneuverable, but we just have millions of places where you can place vehicles like that and they can be at presurveyed points so that the guidance system can be upgraded.

It does not take that long to do that. You can upgrade your guidance system on the missile so it starts from a fixed point so far as the inertial coordinates goes, it starts from just as fixed a position as it would from a silo which has been there 20 years.

I don't see that there is any problem with the accuracy of it compared to anything else. If you have that kind of dispersion characteristic, it seems to me that that has to be a better deterrent for the Soviets than even 100 MX's in silos that they have had targeted for the last 20 years.

General DAVIS. Would you agree that succeeding generations are better than the last?

What you are talking about is succeeding generations being better than the last. We are looking at the small ICBM's as a follow-on, as it were, to MX, but both systems will be deployed.

Unfortunately, we have not even begun to solve all the environmental problems attendant to the small ICBM because we have not started to deploy it yet.

Senator GLENN. I guess our difference of opinion on this comes down to how fast we need it. It is not whether the mobile can do the job. I think everybody agrees the mobile can do the job and we can develop a mobile that will do the job.

It is just a matter of timing and whether we need this type of extra coverage from the MX in this, depending on your estimate, 2- to 4-year period as opposed to being willing to forgo that and say develop the mobile as fast as we can and cover as much of the 2-year period as we can fill in.

General DAVIS. Yes, sir, we are betting an awful lot that our timetable is good on the other end, too.

As a taxpayer, I would feel a lot safer with the bet hedge. I would consider far more capability than bet hedging; it would be the best capability in the world.

Senator GLENN. I guess we have developed a pretty good confidence in our engineering ability to do these things through the years.

I don't want to get into a big long philosophical discussion here, but when I was directly involved in some of the programs trying to qualify the old Atlas we had 45 or 47 flights. They kept blowing up and doing all kinds of things. We finally got it man rated and we went.

We have gotten now to where you are ready to go ahead and say the MX is good because we have had six or seven tests now.

To illustrate further the confidence in our new engineering ability we have in this country with regard to missiles and the confidence level, they put together that space shuttle with solids on it,

and when you light those solids, as you are aware, you can't throttle them. Once you light those, it is not a question of whether you are going, it is which direction. That is no joke; that is it.

We had confidence enough in that program that we put people in it the first crack off the pad. We put people on the mission. That is the kind of confidence we have in our engineering.

The point is this: I wouldn't see any big slip, obviously, you never do before you are in the middle of the program, but I would have a pretty high confidence level that we could bring the mobile right along in time and possibly even move the dates up some if we put a lot of emphasis on it and close in some of that time period and save some money and give a better deterrent at a cheaper cost.

It is a better deterrent. That is why I keep coming back to it. It is not a point they know they may miss it a little bit. They can hit our silos. They have had them targeted for 20 years.

With the mobile they can't do it. It gives a better deterrent.

General DAVIS. Yes, sir, the Soviets continue with their centerpiece, the SS-17's, SS-18's, and SS-19's which aren't mobile, but they are building blocks. It is just like the MX, it is essential, it is the foundation for the new small missile.

Senator WARNER. I wonder if the Senator would yield so that General Fornell could concur or respectfully disagree with this move up in time for the small missile because I think that is an important predicate.

Senator GLENN. That is a good point.

If I might further comment, Mr. Chairman.

Let us say from your standpoint the worst happens here and the MX goes down the tube and you really see you have to accelerate that mobile and get that thing out there as fast as we can, reliably, of course, but if we could accelerate, how much time compression could you foresee?

General FORNELL. I would like the opportunity to comment on that.

SMALL MISSILE PROGRAM

When we began the Small Missile Program which also has its foundation from the Scowcroft Commission, we set about to put together a program that was what we considered a moderately based program with respect to technical risk. We used a fairly prominent group of citizens headed by General Schriever who is the father of our Minuteman force design, to advise us on that, along with some industrial and Government leaders.

They took a look at the overall program, identified the areas which would be technical challenges for us which we concurred in. I think you have seen the results of that already.

I think the Air Force even at the outset of the Small Missile Program was somewhat criticized for dragging its feet which we violently objected to because we thought we pushed the wagon pretty darn good, considering where we were and considering all the aspects.

Senator GLENN. We have disagreement on that. I was one of those criticizing it. That is the reason I put in the amendment.

General FORNELL. The amendment I want to assure you is being followed.

We used at the outset of the program a very distinguished group, General Schriever and his colleagues. They put together a program that made sense, one which General Scowcroft recommended as well. It is phased so we don't enter into a crash program, one which we will avoid having to come back and redo things that we didn't have a good handle on.

We set aside a separate management team which I know you have met. General Englund is in place with a distinguished group of people. We have examined those parts of the program that have technical challenge.

I am pleased to report in only a year and a half we have done a lot of things with respect to propulsion, with respect to guidance and alternate guidance systems and, in particular, the mobility parts of the program.

Those were difficult because we are asking the missile to do things that were not within our technical capability earlier. So, I feel that we have a prudent program. It is high priority.

We are expending, I think, the right amount of money for the pace of the program to do those things, but without unnecessary risk or in a high crash program sense, but with the priority which I think was the intent of your amendment.

All the things you have said about mobility are in the Small Missile Program and I think it shows tremendous promise for the overall long-term survivability.

Senator WARNER. This program is paced by technical milestones and not availability of appropriated funds?

General FORNELL. That is correct, sir. It is not restricted by money.

Senator WARNER. It is driven to its maximum, but eliminating high risk, which high risk is historically associated with crash programs?

General FORNELL. Exactly. You will find that quote as you stated it within the Scowcroft Commission report which we used as an overall recommendation to get started.

Senator WARNER. If we continue on that program, the one you are on now, when is your IOC?

General FORNELL. Currently we say early 1990's because there again a year and a half or 2 years into the program it is hard to declare absolutely when you could be ready. But based on our best judgment and our program experience in other missile areas, we talk in terms of 1992 for a reasonable IOC, defined similarly to what we do in MX, for example, 10 missiles on alert, something like that, in the definition.

Indeed, I believe it to be a prudently based program, it is logical. There is some challenge. The challenges are well served by the technology that has been advanced with MX.

Senator WARNER. 1992 for 10 vice FOC MX 1989?

General FORNELL. Yes, sir.

Senator WARNER. There is a 3-year gap?

General FORNELL. Yes, sir. FOC and IOC being different.

Senator WARNER. Full operational capability for MX is 1989?

General FORNELL. Yes.

Senator WARNER. I don't know what the full operational capability of the small missile is. We don't know how many we are going to get.

General FORNELL. Again, that depends on the number, sir, once we learn a little bit more as to the efficient production numbers, et cetera.

Senator GLENN. How much could the dates be pushed up on the mobile or pushed back or compressed if we put maximum effort into it?

General FORNELL. Sir, I think we are putting the right amount of effort into it now. Certainly you could put more in the program, but then I think you increase the technical risk beyond that which I would recommend you to put in this program.

Now, there are technical constraints, technological maturity, and that takes time. It is not unusual. In fact, we have compressed the FSD to IOC time on the small missile by almost 2 years as compared to MX.

My statement is, and I will stand on that, that we have a prudently based program now. This considers the technical risk, that is those areas that we have never examined before with respect to mobility. In addition, we want to maintain maximum competition on the program because we need to drive down the long-term life cycle cost of the system.

Senator WARNER. The answer to your question I am very much interested in because this will be on the floor. Their professional opinion is that it can't be pushed.

Senator GLENN. The only other statement I would make on this, I think you are right now and I don't quarrel with the general thrust of this at all, but in the past we may have had a technology limit and not a dollar limit, but it was my humble opinion at one time we had a will limit, a lack of will to move on this small mobile because we had to blast to get people going.

We talked to some of the second echelon people over across the river, and so on, and I know what was going on. It was not receiving the same kind of attention that the Congress had intended. There were all sorts of foot dragging.

I am very complimentary to General Englund and what he is doing out there and he is moving on this thing. There was a long period of time when we may not have been technologically limited or dollar limited, but the will to move limit was darn sure in place.

Maybe we have corrected that. I don't want to hash old battles again, but I hope we are not going to go through that again and I don't think we are.

I think General Englund is moving out there. I want to see the same kind of emphasis on that thing. If we put the same kind of emphasis on the small mobile that we put on MX, we could have the mobile in place now ready to go with the same timetable as the MX. Maybe that is overly optimistic.

We would have been in better shape now had we gotten attention on the mobile earlier than I think we are putting on it now. That is the reason I was questioning whether we could not reduce the time period.

General FORNELL. My disagreement is a major philosophical difference. I think there were a lot of contributing things to that per-

ception, but we indeed grabbed that idea when you offered it and it takes a bit to get a program started of that magnitude.

I am quite proud as you are of their accomplishments to date.

Senator WARNER. Thank you, gentlemen. This has helped us a great deal. We may have to have you back.

General DAVIS. I will answer your call.

Senator GLENN. Gentlemen, CEP's of the Soviets, what do you give them the capability for doing?

General DAVIS. It varies. [Deleted] let me refer to my chart—[deleted]. You ask [deleted].

Senator GLENN. We are hardened to what?

General DAVIS. [Deleted.]

Senator GLENN. We have some questions which we ask you to submit answers to for the hearing record.

[Questions with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR JOHN WARNER

SURVIVABILITY

Senator WARNER. In the President's report on release of the fiscal year 1985 funding for MX, it states that from a technical viewpoint the vulnerability of Peacekeeper missiles based in existing Minuteman silos will be roughly similar to the currently deployed Minuteman ICBMs. Do you agree with that assessment?

General DAVIS. I would agree with that technical assessment. However, recent analysis indicates that the silos at F.E. Warren AFB, where Peacekeeper will be deployed, are among the hardest within the Minuteman force. Further, the canisterized Peacekeeper missile with improved hardness against nuclear effects will, to some degree, also improve in-silo survivability.

More importantly, the vulnerability aspects of Peacekeeper must be viewed in the context of the many inherent difficulties which confront a Soviet attack on the entire U.S. triad. Technical assessments aside, U.S. silos are relatively safe from Soviet SLBMs. For example, the best Soviet SLBM today achieves less than a [deleted] probability of damage against the Minuteman silos. Furthermore, an SLBM launch would provide tactical warning of an attack, and initial SLBM detonations would confirm the attack well before the more effective Soviet ICBMs arrive. A staggered Soviet ICBM/SLBM attack provides nearly 30 minutes of warning to the triad. Thus, Soviet planners must consider that the U.S. could launch a large portion of the Peacekeeper force prior to a full laydown.

COMPARATIVE ICBM CAPABILITIES

Senator WARNER. You indicate in your statement that today the Soviets can significantly threaten our ICBM force while we have only a limited capability to place their ICBMs and other key hardened assets at risk. Will you elaborate upon that statement, and quantify the disparity that leads to what you describe as a highly destabilizing situation?

General DAVIS. What I need are prompt, accurate weapons that can hold valuable hardened targets at risk—missile silos, hardened control facilities and so forth. Right now, I can't do that job very well, and both deterrence and stability are the weaker for it. On the other hand, the Soviets have emphasized that capability for years, and their high-yield, accurate ICBMs give them a very real advantage.

More specifically, the Soviets have about [deleted] with which to attack approximately [deleted]. Conversely, we have nearly [deleted] which have a limited capability to damage approximately [deleted] in a time-urgent manner. Of these RVs, only [deleted] which has the yield and accuracy to place their superhard silos [deleted]. This mismatch in hard target capability allows the Soviets to [deleted] while retaining about [deleted] in their inventory. Our current deficiency in prompt, hard-target capability is highly destabilizing, coercive, and is a weakness in our overall fabric of deterrence. One hundred Peacekeeper missiles with 1000 weapons will help redress this imbalance.

SUPERHARD SILOS FOR PEACEKEEPER

Senator WARNER. How do you assess both the technical prospects for and the military utility of eventually deploying Peacekeeper missiles in superhard silos? Do the designs now under consideration introduce any new factors from the viewpoint of the operational commander such as timeliness of launch?

General DAVIS. The technical prospects for superhard silos look very good. Recent tests at small scale have demonstrated levels of silo hardness previously thought unattainable. However, for superhard silos to be a viable option, this success at small scale must be extended to full scale demonstrations and include methods of protecting critical missile systems and communication equipment. Any decision on basing Peacekeeper in superhard silos must await more complete system tests scheduled over the next two years.

Levels of silo hardness currently under consideration would force significant changes in Soviet systems and tactics. The Soviets would have to significantly improve accuracy or employ higher yield warheads. In either case, the Soviet planner would face less certainty of success in planning his attack, resulting in increased deterrence and strategic stability.

We have not identified any new factors associated with the designs now under consideration. Any launch delays caused by new equipment or closure design should be minimal and will not impact operational planning.

PENETRATION CAPABILITIES

Senator WARNER. The committee has received several briefings that point to the possibility of expanded Soviet ballistic missile defenses, either with dedicated systems, or with air defense systems with anti-ballistic missile capabilities. What is your assessment of this possibility, and what is your judgment concerning the pace and emphasis of penetration aid programs now underway or requested for ICBMs?

General DAVIS. The intelligence community continues to assess a [deleted] for expansion of the Soviet Ballistic Missile Defense system in the [deleted] while the [deleted]. The Soviets value the ABM treaty for both military and political reasons; however, their intentions regarding the treaty [deleted] in response to any number of factors.

We will begin full-scale engineering development of Minuteman III Penetration Aids in fiscal year 1987 and will reach an initial operational capability in fiscal year 1991. The planned systems will consist of [deleted]. These penetration aids [deleted]. As currently structured, this developmental program will place us in a posture to [deleted].

SMALL ICBM (WEIGHT)

Senator WARNER. Congressional direction has constrained the small ICBM to 30,000 pounds (with the possibility of a ten percent margin). In your judgment as an operational commander, what has been the effect of this constraint in terms of designing a missile that meets current and projected military requirements?

General DAVIS. The Scowcroft Commission recommendation to design a single weapon ICBM capable of mobile deployment necessitates a small missile. As with any ICBM system, there is a direct relationship between booster size and range/payload. Given the Congressionally directed weight constraint, our requirement to range the Soviet target base with enough throw weight and accuracy to provide hard-target kill capability presents a challenge. However, the Ballistic Missile Office is vigorously pursuing propulsion, structural, and guidance technology to meet our requirements within the 30,000 pound limit. As the system progresses through the concept definition phase, we will continuously measure predicated missile performance against mission requirements.

SMALL ICBM (AIRS GUIDANCE)

Senator WARNER. One of the significant cost issues concerning the Small ICBM is the AIRS Guidance. As you are aware, the development program is exploring the possibility of alternative guidance systems that may be less expensive, but also may be somewhat less accurate than the AIRS. How do you view these tradeoffs between affordability and accuracy performance?

General DAVIS. The guidance systems of modern ballistic missiles are, as you indicate, one of the most expensive elements. However, any tradeoff of accuracy versus guidance system cost must account for the ability of the resulting system to satisfy the military requirement. The primary military requirement driving the consideration for more accurate guidance systems is the achievement of a high probability of

damage against the hardest Soviet military facilities. The AIRS guidance presently meets this military requirement. Alternate guidance systems, which may be less expensive, have not demonstrated AIRS accuracy. They also require additional calibration time to achieve their best accuracies. While this delay may be acceptable for some Small ICBM missions, the degrade in accuracy is not. If alternate guidance systems can achieve AIRS accuracy, I would be most interested in evaluating their utility on the Small ICBM. As the small ICBM evolves, we will continue to evaluate these and other system design trade studies.

OPERATIONAL TEST MISSILES FOR MX

Senator WARNER. Some have suggested that significantly curtailing the operational test program is one way to reduce the costs associated with Peacekeeper. From your perspective, how would such a reduction affect your confidence in the operational performance of the missile? Are there any conditions under which you would recommend reducing the number of operational test missiles? Are the number of operational tests required independent of the total number of missiles deployed?

General DAVIS. Reduction in the number of test missiles would significantly reduce confidence levels in weapon system reliability and accuracy. High confidence level planning factors enhance incorporation of Peacekeeper missiles into our operational plans. As such, I would not recommend reducing the number of operational test missiles. Finally, the number of test assets is a statistical determination and is independent of the total number of operational missiles deployed. For example, when 200 Peacekeeper missiles were being considered for deployment, we still required 123 test assets to cover a 15 year system operational life.

ICBM FORCE

Senator WARNER. Could you comment on the current condition of the Minuteman force in terms of aging, performance or other similar considerations? Can you put the planned ICBM modernization program in the context of the long-range plans for the Minuteman force?

General DAVIS. The Minuteman force has far surpassed its original 10 year design life, and we find that increasingly intensive and expensive efforts are required to continue its operational performance until the end of the century. Although an aging system, it remains a key element of our strategic deterrent force because of its high alert rate and responsiveness.

In this context, we have initiated programs to ensure the system remains reliable, supportable, and maintainable. Propulsion programs are in progress to correct age-related degradation in both Minuteman II and Minuteman III boosters. Several programs are underway to enhance the supportability and performance of Minuteman guidance systems. The Rivet Mile program, which starts this year, will refurbish Minuteman ground facilities to counteract aging and environmental effects. We will also replace major items of support equipment which are no longer supportable, such as missile transporter-erectors and automatic test equipment.

While Minuteman will continue to be effective against a wide range of targets, it cannot satisfy all projected ICBM targeting requirements. For example, [deleted]. As a result, the planned ICBM modernization program includes the deployment of 100 Peacekeeper missiles. Today, Peacekeeper accuracy and yield will give us [deleted].

QUESTIONS SUBMITTED BY SENATOR STROM THURMOND

EFFECTIVE COMMAND AND CONTROL

Senator THURMOND. General Davis, how difficult is it to maintain effective command, control and communications with 1,500 mobile ICBMs as opposed to one field of 100 Peacekeepers?

General DAVIS. Maintaining connectivity with 15 times as many systems would certainly be more complex. Moreover, the technical problems associated with communicating between mobile systems, deployed over a wide area, are challenging. On the other hand, the hardening required for command, control and communications (C^3) supporting a fixed system also presents some problems. But in the final analysis, both the common and unique problems associated with each deployment mode can be overcome with current technology.

SURVIVABILITY OF PEACEKEEPER AND MOBILE MISSILES

Senator THURMOND. Which is more survivable, Peacekeeper in super-hadened silos with a ballistic missile defense overlay, or mobile missiles?

General DAVIS. While estimates of ICBM survivability are always highly scenario dependent to include such factors as the nature and sequence of an attack, deployment area, type of weapons used, and ability to target the weapons, the issue here is technology. Testing and engineering analyses to date indicate that it is feasible to build superhard silos and hardened road-capable vehicles. We are also encouraged by the results of the initial studies and research on ballistic missile defenses. While promising, these technologies are not mature today. This being the case, any ranking of their potential effectiveness is speculative at best.

NUMBERS OF SMALL MOBILE MISSILES

Senator THURMOND. General Davis, how many small mobile missiles will be necessary to give us needed target coverage in an environment that is not constrained by arms control limitations?

General DAVIS. It is a little early in the development cycle to attempt precise definition of small mobile missile requirements. The Small ICBM, whatever the deployment options, will not be available until the early 1990s. Furthermore, the small mobile missile requirement will be affected by the degree to which we follow through with the planned modernization of each leg of our stragetic triad of nuclear forces. The nature of the Soviet target base in the timeframe of interest is another important consideration. As the modernized forces materialize and evolution of the Soviet target base in the 1990s becomes clearer, we will determine the number of small mobile missiles required to obtain target coverage.

QUESTIONS SUBMITTED BY SENATOR DAN QUAYLE

MILITARY EFFECTIVENESS OF SDI

Senator QUAYLE. If SDI was effective, might it be militarily ineffective for the Soviets to proliferate existing missiles? Might SDI force the Soviets to move to smaller, more evasive, less indiscriminately destructive missiles systems than they now target against us?

General DAVIS. SDI is a program of vigorous research focused on advanced defensive technologies. As such, there is no preconceived notion of what an overall defensive architecture against ballistic missiles should entail. Thus, any attempt at this point to address whether the Soviets could overwhelm the system by missile proliferation, move to high technology alternatives or develop some other responses would be speculative at best.

CRUISE MISSILES AND SA-10 EFFECTIVENESS

Senator QUAYLE. In light of recent estimates by MIA and DIA of SA-10 effectiveness, what is it that we must do to make our cruise missiles able to penetrate?

General DAVIS. The SA-10 has an [deleted]. Programs to [deleted]. These planned improvements, along with ongoing hardware and software changes in the current generation ALCM, will enhance overall cruise missile penetrativity.

NEACP VULNERABILITY TO SLBM ATTACK

Senator QUAYLE. How accurate are recent claims made in Scientific American (Jan 85) and elsewhere that NEACP is vulnerable on its air strip to possible Soviet SLBM attack? Are there any measures you plan to take to make this plane less vulnerable?

General DAVIS. The article in Scientific American appears to be dated. [Deleted.]

ATTACK ON C^3I CAPABILITY

Senator QUAYLE. Earlier this morning, you noted that it was U.S. policy not to launch a counterstrike until detonations on U.S. soil were detected. If the Soviets launched a massive attack first against our C^3I capability, how likely would it be today that the President would be able to order a counterattack after consultation with his advisors before most or all of our fixed silo based ICBMs might be hit?

General DAVIS. [Deleted.]

QUESTIONS SUBMITTED BY SENATOR JEREMIAH DENTON

TRIAD PENETRATION OF MOSCOW TARGET COMPLEX

Senator DENTON. How do you candidly assess the ability of each leg of the triad to penetrate the defenses of the Moscow target complex and credibility to threaten the key targets there?

General DAVIS. The synergistic effect of the triad allows the planner to optimize the offensive application of U.S. forces against Soviet defenses. The current [deleted]. Additionally, some [deleted].

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN

SALT II NUMERICAL LIMITS

Senator LEVIN. Would the United States be less safe militarily if the Soviets deployed MIRVed ICBMs, MIRVed submarine-launched ballistic missiles (SLBMs) and heavy bombers and cruise missiles, and MIRVed missile warheads per missile in numbers above the present numerical limits in SALT II? Would it be harder for SAC to accomplish its mission in this situation? Would the capabilities of our deterrent forces decline?

General DAVIS. The Soviet Union, due to its production base, has an enormous capability to field systems. If they were to "break out" of the treaty limits of SALT II, the disparity between the number of warheads held by the Soviet Union and the United States would be significant. The disparity in number of delivery vehicles could grow to 1.5 to 1. This asssumes that the U.S. has the will to continue to produce modern systems and keep our own production lines "hot." Without the commitment to produce our own systems, the disparity would be even greater and the job SAC is called on to do even more difficult.

The utility of a Soviet nuclear stockpile vastly greater than our own transcends the simple comparison of numbers. The considerable coercive leverage inherent in large numbers of nuclear weapons could affect the relationship between the U.S. and its allies and their respective force modernization programs. Any action by the Soviet Union which would change the nuclear balance so dramatically could adversely affect strategic stability.

The continued capability of our deterrent forces is predicated on the modernization effort we have embarked upon. Even if the Soviets did not field systems in ever increasing numbers, the capability of our deterrent forces will decline without the continuation of our modernization efforts.

U.S.-U.S.S.R. THROW WEIGHT

Senator LEVIN. Are we relatively better off now vis-a-vis throw weight of strategic nuclear missiles in the U.S./Soviet inventories than we were in 1980?

General DAVIS. The calculation of strategic nuclear missile throw weight, as defined by the SALT II Agreement, is the sum of the weight of its reentry vehicles, penetration aids and any self-contained dispensing mechanisms. Comparing strategic nuclear missile throw weight, we are now [deleted].

NUMBERS OF DEPLOYED WEAPONS

Senator LEVIN. Who has more strategic nuclear weapons deployed—us or the Soviets? What are the figures broken down by each leg of the triad?

General DAVIS. Precise comparisons of deployed weapons are difficult to obtain because of differing U.S. and Soviet concepts of operation. Additionally, uncertainty as to the specific [deleted] due to maintenance requirements also make comparisons difficult. However, assuming maximum Soviet SLBM MIRVing, the U.S. has a slight advantage in total weapon counts. Broken down by each leg of the triad, the following comparisons apply: [Deleted] the United States has approximately a 2 to 1 advantage in SLBM weapons (approximately 5,600 U.S. weapons versus 2,800 Soviet weapons), the Soviets have approximately a 3 to 1 advantage in ICBM-delivered weapons (approximately 6,300 Soviet weapons as compared to 2,000 U.S. weapons).

ROLE OF SDI ON SAC MISSIONS

Senator LEVIN. General Davis, as SAC Commander you primarily are concerned with the present day-to-day operations, maintenance and targeting of our strategic

nuclear forces and whether they continue to be capable of successfully attacking the Soviet Union.

However, SAC has a major role to play in developing requirements for new weapons systems to ensure that future SAC commanders have the necessary capabilities to carry out their deterrence mission. For example, SAC drafted the Required Operational Capability Document (ROC) for the MX missile; it certainly had great influence in creating the B-1B and the ATB. An entire section of SAC called "Plans" is responsible for studying the Command's future needs, including what the future bomber force structure should be.

Because of this role in the future viability of our strategic forces, are you concerned about the impacts a Soviet SDI system might have on SAC's ability to perform its mission?

General DAVIS. The Strategic Air Command, as the operational command charged with maintaining two-thirds of the strategic triad, has a vital role in developing new systems to maintain the viability of deterrence in the face of real Soviet defensive improvements. Estimates as to the nature of their current system allow us to develop appropriate measures to counter them. Currently, we are pursuing several programs for that purpose. For example, the full scale engineering development of [deleted]. On the other hand, a "Soviet SDI", as you put it, is quite a different matter. There is no intelligence community consensus as to what they would be. Assessment of Soviet research and development will continue; however, [deleted]. Until such time as sufficient information is available to accurately define a fielded "Soviet SDI," we cannot project its impact on our forces.

ASSESSING SDI

Senator LEVIN. It is my understanding that your Plans Office is assessing the impacts of a Soviet SDI on our Nation's deterrent forces, is that true?

General DAVIS. My Plans Deputate, as well as other concerned organizations at SAC, are following very closely the developments in our SDI program as they continue to unfold. They continually apprise me of new information on this subject. As for the Soviets, before any valid assessment can be made many factors need to be understood and defined. There currently is no intelligence community consensus as to [deleted] of a "Soviet SDI" to use in assessing potential impact. However, we will continue to carefully monitor their efforts.

DESIGN CHANGE OF MISSILES VERSUS SDI

Senator LEVIN. Should you be concerned whether we will have to change the designs of our ICBMs and SLBMs to defeat a Soviet SDI?

General DAVIS. Any time there is a development that affects the military balance between the Soviet Union and the United States the military community as a whole has to be concerned. It is our responsibility to ensure the security of the country by maintaining the credibility of our deterrent. However, there is today no intelligence community consensus on [deleted] "Soviet SDI." Until such time as sufficient information is available, it is premature to postulate potential U.S. reactions, especially the specific details of ballistic missile design changes.

MEASURES TO DEFEAT SOVIET SDI

Senator LEVIN. Should you be concerned whether we will have to proliferate the number of missile warheads, decoys and other penetration aids we deploy to defeat a Soviet SDI?

General DAVIS. As I stated previously, the whole military community must be concerned about developments by the Soviets that affect the military balance. As you know, the overall Soviet R&D program is extensive. The number of basic research programs with possible application in this area is significant. Until determinations can be made as to which programs will be moved into testing phases, and beyond that, what the composition and real capabilities of a deployed "Soviet SDI" will be, it is premature to postulate detailed U.S. responses.

SDI AND THE COMPOSITION OF FUTURE FORCES

Senator LEVIN. Do these issues have major implications for the size, cost and composition of future U.S. strategic forces and thus for SAC's capabilities to perform its mission?

General DAVIS. There are many factors that affect force size, cost, and composition. Before any valid assessment can be made, these many factors need to be understood and defined to the best of our ability. As I have previously stated, it is pre-

mature, at this point, to speculate concerning the form and technology of a "Soviet SDI" system, let alone the impacts that such a program could have on our force structure and its capabilities.

SAC ROLE IN DEVELOPING SDI

Senator LEVIN. Do you think SAC should be taking an active role in assessing proper countermeasures to a Soviet SDI—not only to address the above issues but to make sure that our R&D people have full benefit of SAC's operational experience in this task. Isn't designing something in a laboratory a bit risky without knowing whether it makes sense operationally in the field, when the real world of bad weather, different personnel, movement, tactics, all must be considered?

General DAVIS. The intelligence community continually monitors evolutions in Soviet force structure, as well as their research and development efforts. When such evolutions require an adjustment to the U.S. R&D program, SAC develops the "Statement of Need" used to devise counters to Soviet initiatives. Such needs are guided and monitored by personnel at SAC through all phases of development and acquisition, insuring operational factors, such as those you cited, are taken into account in the development of potential solutions.

FORM SOVIET SDI MIGHT TAKE

Senator LEVIN. Have you discussed with General Abrahamson or other SDI experts, perhaps in the intelligence community, what they think a Soviet SDI would be like and what might be possible ways to develop countermeasures to it?

General DAVIS. The intelligence community has the responsibility to forecast the evolution and content of the Soviet threat. The U.S. SDI program, as has been stated previously, is a vigorous research program focused on advanced defensive technologies. Just as it is premature to estimate the outcome of its investigations into future defensive technologies, it is certainly premature to assess the outcome of any possible "Soviet SDI" research program.

COUNTERMEASURES TO SOVIET SDI

Senator LEVIN. Secretary Weinberger says he thinks a Soviet SDI would be "one of the most frightening prospects" imaginable. Should SAC be considering what countermeasures are needed?

General DAVIS. We follow very closely all developments in Soviet forces with regard to their potential effect on related U.S. capabilities. As the intelligence community analyzes new information and a consensus evolves on a forecast for a "Soviet SDI," a framework for U.S. responses to maintain our deterrence can be fashioned. This would allow us to address any challenge to the continued credibility of our deterrent forces.

DEFENSE AGAINST AN SDI

Senator LEVIN. SAC spends great effort worrying about how to counter Soviet air defenses against bombers and its present BMD system. It worries about whether various programs in the annual budget request are approved for this reason—such as counter-Soviet AWACS (SUAWACS); Advanced Strategic Missile Systems (anti-BMD); many electronic warfare systems against air defense radars. Should it worry about how much money and effort, and of what types, are being expended to counter a Soviet SDI?

General DAVIS. In meeting with its deterrent responsibilities, SAC is continually concerned with maintaining systems that are effective against fielded defenses. As you have stated, there are currently several programs for this purpose. When a "Soviet SDI" threat has evolved sufficiently to allow its definition, we will be able to suggest appropriate responses, both in terms of money and effort.

WARHEADS NEEDED AGAINST SOVIET SDI

Senator LEVIN. Has SAC completed its assessment/studies of the additional warheads and forces it would need to counter a Soviet SDI? A Soviet ABM breakout?

General DAVIS. SAC continually evaluates the potential effectiveness of its forces in light of threats projected by the intelligence community. [Deleted.]

Additionally, as I discussed in previous testimony, the [deleted]. We have programs currently underway [deleted]. We will continue to assess our capabilities as the threat evolves so as to maintain a posture which allows a timely response to potential Soviet expansions.

DEPLOYING MORE WARHEADS AGAINST SDI

Senator LEVIN. Would you recommend we deploy more RVs in the face of prospects for a Soviet SDI? Would SAC's job be harder in face of a Soviet SDI?

General DAVIS. Obviously, any deployment of Soviet defenses in addition to their current defensive array will make SAC's job more complex. But as I have previously stated, it is premature to make any pronouncements at this time concerning possible U.S. responses to a "Soviet SDI" type deployment.

Senator GLENN [presiding]. The hearing is concluded.

[Whereupon, at 12.55 p.m., the subcommittee adjourned, subject to the call of the Chair.]

AFTERNOON SESSION

The subcommittee met in open session pursuant to recess, at 2:05 p.m., in room SR-222, Russell Senate Office Building, John W. Warner (chairman) presiding.

Present: Senators Warner, Wilson, Nunn, Hart, Levin, and Glenn.

Staff present: James F. McGovern, staff director and chief counsel; Robert G. Bell, Robert F. Bott, Douglas R. Graham, John J. Hamre, William E. Hoehn, Jr., and George K. Johnson, Jr., professional staff members and Karen A. Love, staff assistant.

Also present: Romie L. Brownlee, assistant to Senator Warner; Mark J. Albrecht, assistant to Senator Wilson; Allan Cameron, assistant to Senator Denton; Janne E. Nolan, assistant to Senator Hart; Jeffrey B. Subko, assistant to Senator Exon; Peter D. Lennon, assistant to Senator Levin; and Phillip P. Upschulte, assistant to Senator Glenn.

Senator WARNER. The subcommittee reconvenes this afternoon to continue receiving testimony on the ICBM modernization programs. This morning, Gen. Bennie Davis provided us with his views on the subject of ICBM modernization from his perspective as the commander in chief of the Strategic Air Command.

In this morning's hearing, members raised the very important issue of whether our policy has shifted from launch options that the Soviet planners are dependent on.

In the course of that discussion, Senators Nunn and Wilson helped to clarify the definitions of these various options ranging from launch on warning, whereby the National Command Authority would execute forces on the basis of confirmed data from dual sensor systems, to launch after attack, whereby we would execute our forces after nuclear detonations had occurred on U.S. territory.

General Davis, in his testimony this morning, made it very clear that U.S. policy has not changed to a launch after attack policy. This remains, as it always has been, an option that Soviet warplanners must consider in contemplating a preemptive attack against the United States.

What has changed in recent years, as a result of bipartisan congressional support for improving our command, control and communications systems, is that our ability to identify and characterize the objectives of a Soviet attack have improved significantly.

This enhances the deterrent value of our ICBM force in the eyes of the Soviet planner, who cannot discount the possibility that the United States will launch some of its missiles before they are all destroyed.

As Senator Wilson pointed out, the Scowcroft Commission addressed this issue in their April 1983 report. Our next panel includes a member of that distinguished bipartisan Commission, and we will be able to discuss this issue with him.

Our first panel this afternoon will consist of Mr. R. James Woolsey and Mr. Leon Sloss. Mr. Woolsey is currently a Delegate-at-Large to the United States-Soviet arms reduction talks and he was a member of the distinguished bipartisan Scowcroft Commission.

I should add that he is also a former Under Secretary of the Navy. Mr. Sloss is currently the president of Leon Sloss Associates, and he has played an important role in the formulation of U.S. strategic nuclear doctrine. He led the nuclear targeting policy review conducted during the Carter administration that set the direction of our current employment policy.

Our final panel this afternoon will consist of Hon. Thomas Cooper, the Assistant Secretary of the Air Force for Research, Development and Logistics; Lt. Gen. Robert Russ, U.S. Air Force, the Deputy Chief of Staff for Research, Development and Acquisition; and Brig. Gen. Gordon Fornell, U.S. Air Force, General Russ' special assistant for ICBM modernization.

Gentlemen, on behalf of the subcommittee, I would like to welcome you this afternoon. Unless Senator Hart has any opening remarks, we can proceed with our first panel.

Senator Hart?

Senator HART. I have no statement. Thank you very much.

Senator WARNER. Mr. Woolsey, why don't you lead off.

STATEMENT OF R. JAMES WOOLSEY, PARTNER, SHEA & GARDNER, AND DELEGATE-AT-LARGE, UNITED STATES-SOVIET NUCLEAR AND SPACE ARMS TALKS

Mr. WOOLSEY. I don't have a prepared statement. If you would like, I can say a few words about the issue that apparently came up this morning. I was not present so I don't know all that transpired, but from your opening remarks, I take it there was a good deal of discussion of launch under attack and launch after attack with respect to, particularly, the MX.

Let me just say that our view of that issue when we were working on the Scowcroft Commission 2 years ago was that for some time into the future we believed there would be a reasonable degree of inherent survivability in silo-based systems—whether Minuteman or MX in Minuteman silos—if one looked at the strategic forces together, rather than at each one in isolation.

If one looked at the problem that a Soviet attacker would have in planning an attack—specifically on U.S. bomber bases and U.S. ICBM silos—he would face a dilemma because, if he tried to plan a simultaneous launch of close-in submarine-launched missiles together with ICBM's coming from the Soviet Union, the shorter flight time of the submarine-launched missiles—which might, for example, be targeted on U.S. bomber bases but would not for many years be numerous or accurate enough to destroy the ICBM force—would mean that there would be detonations on U.S. soil for some quarter of an hour or so before the main attack of Soviet ICBM's would arrive on U.S. ICBM fields.

Under those circumstances, we felt the Soviet planner would have to consider that there might well be launches of U.S. ICBM's after there had been detonations on U.S. soil. We did not consider that to be launch under attack and certainly not launch on warning, but rather launch after attack, or more precisely, launch after detonations on U.S. soil.

Certainly there would have to be adequate command and control, communications and intelligence to make the prospect that such a launch could occur a credible one. But the very highest priority we set in the Commission was those improvements in command, control, communications and intelligence.

If, on the other hand, a Soviet attack planner should be thinking of attempting to conduct an attack in such a way that there was simultaneous detonations on U.S. soil from both close-in Soviet submarines launching missiles and from Soviet ICBM's, in that case the ICBM's would have to be launched from the Soviet Union some 20 minutes or so before the submarine-launched missiles were launched.

That would mean that our early warning systems would make it possible for a very high proportion of our bomber force to be scrambled and escape the bases, higher even than would be the case under normal alert.

Under those circumstances, the Soviet planner would have to worry that, by planning the attack in that way, he had made it possible for a very high proportion of our bomber force to escape even if the United States were unwilling, to launch ICBM's prior to any detonations on American soil.

So, for that set of reasons principally—there are others, but principally for that set of reasons—we felt that both silo-based Minutemen and silo-based MX ICBM's would offer a reasonable degree of force survivability, if taken in the context of the U.S. forces as a whole, for a number of years.

Now, as one began to move into the mid- to late 1990's and beyond, as one began to become concerned about MIRV'd accurate Soviet submarine-launched ballistic missiles, Soviet improved bomber defenses, and other improvements against our strategic forces, we felt in that period of time it would be appropriate for the ICBM force to evolve in a direction of small, quite possibly mobile, ICBM's along the line of the so-called Midgetman which the Commission recommended.

So, that was our view at the time and it remains my view now of the so-called launch under attack or launch after attack.

I would add that I am not privy to and do not know precisely what planning has occurred in the last 2 years or so at SAC on this issue, but we did not feel at the time in 1983 that it was necessary for the United States to change its traditional doctrine with respect to launch under attack or launch after attack.

LAUNCH UNDER/AFTER ATTACK

Senator WILSON. Excuse me. You said launch under attack and launch after attack. I take it you are using the terms interchangeably.

Mr. WOOLSEY. No, I do not mean to. Let me make one further point.

I mean to distinguish launch after attack as I did in the first part of my remarks from launch under attack. What I meant to suggest after that last sentence was that I believe there is a certain studied degree of ambiguity in the U.S. Government's public position on this issue.

It has long been felt, I believe, that a certain degree of uncertainty in the Soviets' mind with regard to whether or not the United States would or would not launch under attack was something that added to the credibility of deterrence.

I am not, therefore, attempting here to speak about precisely what our operational doctrine is or is not. I was talking in the whole first part of my remarks about the force planning concerns which we felt were salient and were the reason we were willing to recommend the interim policy of modernizing the ICBM force in part by deploying MX in Minuteman silos.

I will reiterate that that latter step we did not believe, and I do not now believe, will require any change in U.S. doctrine with regard to the type of launch that it would plan for its strategic forces.

Senator WARNER. Have you finished your direct presentation? If so, I think we might hear from Mr. Sloss.

STATEMENT OF LEON SLOSS, PRESIDENT OF LEON SLOSS ASSOCIATES

Mr. SLOSS. Thank you, Mr. Chairman.

I have distributed some remarks which are in the form of questions and answers to myself which I find myself doing when I think about MX. I won't read those verbatim, but will highlight a few points, if I may.

I was asked particularly to talk about the relationship of MX to employment policy which is something I have worked on for a decade. In the first question I give you my definition of employment policy in a very brief compact form. I stress why I think we have moved to a policy which emphasizes options.

In my opinion, an effective deterrent emphasizes a variety of options. I make the point that military planners do have to face up to an unlikely, but nevertheless a possible contingency that deterrence could fail and we could find ourselves in a nuclear war.

That is not a pleasant prospect to think about, but I think the planners have an obligation to think about it. We ought in those circumstances to do the best we can to control escalation, and that is another argument for having choices.

Second, I address the question whether there are targets for which ICBM's represent unique capability. I think there are and I explain why.

ICBM's, of course, have more rapid response capability than bombers, at least under present circumstances greater accuracy and more assured communications than the submarine force. The submarine force will improve in accuracy, as you know.

I think the most important argument, is the one which is set forth by the Scowcroft Commission which Mr. Woolsey has just re-

peated; that being the synergy that you get by having mixed forces. It complicates the enemy's targeting problem which Jim described very well and it also provides a wedge against any unanticipated vulnerabilities that might occur in one or other leg of the triad.

I express my view that the triad is a sound concept for those reasons and that under present circumstances it does not seem to me that we would want to abandon it, or analyze it from a narrow point of view of the targets that we have to cover, that we could cover all of them as well as with bombers or SLBM's.

There are many urgent hard targets that we want to try to cover in our employment plans. ICBM's are an example, but not the only example. I take up the idea that has been advanced by some that we might achieve the same objective by basing ICBM's on the coastal shelf, in minisubmarines in the Great Lakes, and there have been other such suggestions.

I bring it up because I think these are interesting ideas and they need to be explored. These ideas are just that. They are merely concepts at the present whereas the ICBM is a system that exists.

I raise on page 4 on my prepared statement whether in fact the Soviets would launch under attack and, therefore, make an attack on ICBM's futile. In my view, while it is likely they will launch some of their ICBM's under attack, if not preemptive, with the size of the Soviet ICBM force today and the interest they show in retaining reserves and the fact that ICBM silos in the Soviet Union can be reloaded because they use a cold launch technique, there will still be plenty of targets, I believe, for a retaliatory strike even if the Soviets launch their ICBM's first or under attack.

I address the question which has often been raised, whether the ICBM is a first strike weapon. I suggest that whether a weapon is a first strike or not is not so much inherent in the characteristics of the weapon as it is in the doctrine and the context in which the weapons are used.

Nevertheless, I want to be clear that I don't feel comfortable with systems that are highly vulnerable and I think we ought to be moving in a direction away from vulnerable systems.

My own view, as expressed here, is that we need to give the Soviets an incentive for moving away from large MIRV'd ICBM's. The Scowcroft Commission made this point. I don't think we can count entirely on either their good will or expressions of intent or even arms control negotiations.

I think we have to provide them with real incentives that make it look unattractive to maintain those systems and I think that is one of the arguments that I would make for continuing to have a counterforce capability. I think we also have to continue efforts to try to protect them.

On page 5, I raise another frequent argument that if MX is deployed in vulnerable silos, won't that invite attack?

That is kind of another way of addressing the last question. The point that I stress here is that, yes, we ought to be moving toward systems that are less vulnerable, but those systems are really not competitive in time with the things that we have now.

You have to be prepared to accept some delay if you defer or cancel the MX and wait for the single. It is a matter of judgment as to what risks are involved in that delay. It seems to me from

past experience that these delays tend to take longer than we think at the outset.

So, I think that the gap between MX and what may come after it is not a trivial question. We need to be realistic about that. We are giving up a bird in the hand for one that is somewhere out there in the bushes. That does not denegrate the concept of the small ICBM's because I think that is an important capability. I address the question of why we should not wait.

Finally, while it is not strictly within the terms of the employment policy, I want to address the bargaining chip argument because it is one that is much discussed and I think frequently misunderstood.

With apologies to my colleague here who is to be involved in the negotiations, I want to say two things and I want to say them as clearly as I can.

First of all, I am very skeptical of the traditional bargaining chip argument, and particularly identifying a weapon system as a bargaining chip. It seems to me that if this particular system, whatever it may be, is of sufficient utility to have real bargaining leverage, then it is not clear to me why we should abandon it.

On the other hand, if it is not a system that we consider of great value, it is not clear to me that it has bargaining leverage. I don't think you can stop there. I don't want to be quoted as saying that I am opposed to bargaining chips, period, because I think you have to go beyond there and that is what I say in the last paragraph.

It seems to me that what happens to the MX is not irrelevant to arms control because as I perceive the Soviets, based on a study Mr. Woolsey and I were both involved with this summer where we looked at our experience in negotiating with the Soviet Union—use arms control negotiations as part of a much broader panoply of actions to try to influence the decisions that we make in the west, to try to control our arms with minimum control on their arms.

Arms control is part of a larger picture. Obviously, they are using propaganda and they are using political pressure on us and our allies to try to discourage us from doing certain things that worry them. They much prefer and have in fact sometimes been successful in getting us to control our arms without entering into an agreement.

So, I think if we undertake to curb things unilaterally, they are going to take encouragement that they can in fact achieve their objective without signing an agreement and, therefore, we are going to have more difficulty in negotiating agreements.

I think it is in that context that you have to think about what we do with the range of weapon systems that may be part of these upcoming negotiations, not in the crude sense that this will be a bargaining chip, if they do this, we will pull it off the table and decide not to employ it.

But I think it is in a more subtle sense that if they believe they can achieve their arms control objectives by propaganda, by putting pressures on us and by sitting down and talking at the table and by not signing an agreement, then there is very little incentive for them to come to an agreement, which is what we would like to see at the end of the process.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Sloss follows:]

PREPARED REMARKS BY LEON SLOSS

I was asked, on rather brief notice, to prepare some remarks about the role of ICBMs (and specifically of MX) in U.S. employment policy. ICBMs also fulfill other strategic objectives. They contribute to the goal of "essential equivalence", and they contribute to the triad which complicates an adversary's targeting and provides a hedge against a unique vulnerability which could emerge in any one system. However, I am going to focus on the role of the ICBM in employment policy, assuming others will address other objectives.

If you spend enough time worrying about MX, you are likely to end up talking to yourself. So I have prepared the following in the form of a dialogue with myself. I hope the committee will accept this somewhat unique format.

Question 1. How should I define employment policy to the committee?

Answer. It is the strategy you develop for using your forces and the plans that support that strategy. In a nuclear world there is a significant paradox. You plan nuclear weapons primarily to deter—so as not use them; but if they are to deter it must be credible that you could and would use them. Thus, our plans and the capabilities that support them must be plausible (or at a minimum not implausible) in the sense that the other fellow believes you might execute the plans.

This requirement for credibility or plausibility has led in recent years to the development of a range of employment options (i.e., attack plans) which would permit the selective and discriminate use of nuclear weapons in response to various levels of aggression. Many (myself included) believe this makes for a more effective deterrent and also gives some prospect of controlling escalation and limiting damage if nuclear weapons are ever used. At the very least, having such options is preferable to having only one plan for a massive response that, as President Nixon said more than a decade ago, could leave a President the unhappy choice of suicide or surrender. While nuclear war is, in my view, a remote prospect—and our policies are directed at keeping it remote—responsible governments cannot ignore this contingency, and consequently must attempt to limit the consequences if nuclear war occurs.

Question 2. Are there targets for which ICBMs represent a unique capability?

Answer. Yes there are. The unique characteristics of ICBMs are speed of delivery (as compared to aircraft and cruise missiles), and reliability and speed in communications (as compared to submarine-based missiles (SLBMs). In addition, today the ICBMs have a capability against hard targets that SLBMs do not have. In the future, the Trindent II (D–5) is expected to have such a capability, but there will still be questions about the reliability of communicating rapidly with the submarines, particularly if we want to be able to retarget rapidly. Thus, the ICBM is, the ideal weapon for hard targets that should be attacked rapidly. There are many such targets, notably enemy ICBMs.

They are also a system that is ideal if you want to be able to retarget rapidly and reliably and there is a growing class of targets that move periodically—for example the Soviet SS–20. As we develop improved capabilities to track these targets we will want improved capabilities to retarget our weapons. This can be done most effectively with ICBMs. The combined accuracy and yield of ICBMs permits us to attack many military targets while minimizing collateral damage to urban/industrial targets. This enhances the prospects for controlling escalation.

Question 3. Couldn't the same missions be performed with SLBMs or bombers?

Answer. Bombers do not have the quick response capability of missiles. They take hours to respond rather than minutes. In hours, many important targets may have moved or no longer be important (e.g., an empty firing position). In theory, SLBMs can perform the same missions once they have accuracies comparable to the ICBM. However, as noted, rapid communications to SLBMs is not likely to be as reliable. Futhermore, the ICBM has a proven, reliable guidance system while the system required to achieve high SLBM accuracy is more complex. Finally, it has long been a tenent of U.S. strategy (and I believe a reasonable one) not to put all our eggs in one basket. As pointed out by the Scowcroft Commission, there is a synergism among the elements of the triad which provides a hedge against unanticipated vulnerabilities in any one system and complicates enemy targeting.

Question 4. What about the idea of basing ICBMs in mini-subs or on the continental shelf or the Great Lakes where communications would be easier?

Answer. These ideas have some promise; they also have some problems. They would not provide the same synergism as the current triad. But more importantly they are just ideas at this point. MX exists.

Question 5. Isn't it futile to try to attack ICBMs; won't they be fired before we can attack them?

Answer. This is always possible; it depends on the scenario that you envision. However, as the Soviet ICBM force has grown in size it seems less and less likely they would find it necessary or desirable to use them all in a first strike, and they have the capability to re-load many of their silos. So even in a retaliatory strike there are likely to be many hard targets requiring urgent attention. Furthermore, do we really want the Soviets to be confident there is no threat to their ICBM force, if they can pose a serious threat to ours?

Question 6. Aren't weapons that can attack ICBMs "first strike" weaapons and, thus, de-stabilizing?

Answer. Weapons alone don't make for a first strike policy. The doctrine for their use also determines policy, and the vulnerability of forces can contribute to perceptions and fears of a first strike. The balance between capabilities and vulnerabilities is very important. If threatening ICBMs is destabilizing then the Soviet strategic forces, along with their doctrine that emphasizes pre-emption, are a major source of instability today. I believe it would be better if both sides had less vulnerable forces. The question is how best to get there from where we are today. It is not enough just to wish it would happen. Nor is it sufficient for just one side to exercise restraint. We need to develop some incentives for the Soviets to reduce their first strike counterforce threat to the U.S. The only way to do this may be to pose a threat to their large counterforce weapons. This can be done by developing our own counterforce capability. Perhaps, in the longer run, defenses can help to reduce our vulnerability and discourage the development of first strike capabilities by the Soviets. Today, our ICBMs represent our best, most reliable counterforce capability, and the best leverage we have to persuade the Soviets to reduce their own first strike counterforce capability.

Question 7. But if MX is deployed in vulnerable silos doesn't that just invite attack or force us to strike first? Isn't this terribly destabilizing?

Answer. Frankly, I don't like to see MX deployed in vulnerable silos. This should only be seen as an interim measure. But this program has been delayed and delayed both because successive administrations shifted policy, and because Congress delayed appropriating funds. Right now it is the only new ICBM program that we have. If we cancel this program we can anticipate at least several more years delay before the small ICBM or some other less vulnerable alternative is ready to be deployed and there are still many unanswered questions about the SICBM program. As so often is the case with military systems, we have a choice between a bird in the hand and one that may be in the bushes—perhaps. It is not an easy or clear cut choice, but, on balance, it appears to me preferable to have something underway than to have a long hiatus in our modernization program. Furthermore, there are still some possibilities for reducing MX vulnerability. These include super-hardening and active defense. So if we proceed with MX it need not necessarily be a vulnerable system in the future.

Question 8. If there are possibilities for reducing MX vulnerability or developing other less vulnerable systems, wouldn't it be better to wait until these are available?

Answer. To wait may mean waiting many years. Meanwhile, our targeting capabilities are eroding as the Soviets take measure to protect key targets with active and passive defenses. We should be working hard to develop the SICBM and other alternatives, but meanwhile we can't afford to do nothing.

Question 9. Doesn't the arguement for MX really boil down to the need for a "bargaining chip" in the arms control negotiations and hasn't this argument been largely discredited?

Answer. It is not just a bargaining chip. I have tried to show that there is some strategic utility for an ICBM with a good counterforce capability. It can do some things that no other weapons system can do.

As to bargaining chips, I am doubtful of the value of the concept. If it is a system of sufficient utility to have bargaining leverage why should we want to give it up? If it is not of great value, why should it have bargaining leverage?

However, this does not mean that what happens to MX is irrelevant to arms control. The Soviets use negotiations as one means of influencing opinion in the West. Their aim is to curb our programs while avoiding restraints on their own. They often have been able to achieve this indirectly without signing agreements or by pressing the literal limits of an agreement while we do not (as with the ABM Treaty). If we cut MX or other programs unilaterally this will help them to achieve their goal and their incentive to negotiate will be correspondingly reduced.

UNITED STATES-SOVIET RELATIONSHIP RE STRATEGIC CAPABILITY

Senator WARNER. Mr. Sloss, I will lead off with some thoughts. On page 1 you state: "They contribute to the goal of essential equivalence."

How would you describe the relationship between the United States and the Soviet Union today in terms of the relative strategic capability?

Mr. SLOSS. I am glad you asked that question. It is one that I like to address.

If we probe a little deeper, you will find I happen to be one who is very interested in strategic defense. I think that we have a tendency in this country to compare only the offensive forces of the two sides.

I think that if you compare both offenses and defenses, the Soviets have significant capabilities. When I talk about defenses, I am not talking just about the very modest ballistic missile defense that the Soviet Union has in Moscow, which in its present form is not a serious strategic capability, but I am thinking of what the Soviets have done in the last decade to harden their missiles, beginning to make them mobile, the concealment of targets, the mobility of a number of targets, their extensive air defenses—these are all defenses and affect the strategic balance.

These, in my view, are measures which have a bearing on the strategic balance because they complicate our ability to carry out our employment policy objectives. I would have to say if you take both offense and defense into account, the Soviet Union has an advantage.

I also will say in the same breath I believe we still have a highly effective deterrent against a nuclear attack against us or our allies.

The important point I want to make is that I think increasingly when we look at the balance, we need to look at it in terms of both offensive and defensive forces. We tend to ignore defenses in the equation.

Senator WARNER. I share your views and that is the answer I desired to elicit from you.

It seems to me that we try to make these comparisons in terms of numerical analyses, number of warheads, launchers, and the like, and we fail to take into consideration the pattern, hardening, and the like, which complicates the target from our perspective in the context of a retaliatory strike.

Mr. Woolsey, would you care to join in this dialog on this subject?

Mr. WOOLSEY. Mr. Chairman, I agree with Leon's description. I do think that with respect to strategic nuclear attack, our deterrent is quite strong and what we are talking about with respect to our own modernization is basically marginal changes in trends. Marginal changes are important and trends are important because one cannot let them go too far or one has something more than a marginal change, one has a major change.

So, this effort to continue to try to make our forces survivable and effective as a deterrent—to me that means effective against Soviet military systems—is in a continuing struggle and unfortunately an expensive one.

I would only add that I think the real dilemma, the real problem, with respect to U.S. strategic forces over the course of the next number of years is not really whether we can deter a bolt out of the blue Soviet nuclear attack against the United States. I think we can probably do that with almost any reasonable range of strategic modernization programs.

The real problem is that we are part of an alliance of free countries—free countries that don't often see things exactly the same way or cooperate well—and our strategic nuclear forces and intermediate range nuclear forces for many years have borne part of the obligation of deterring Soviet massive conventional attack, particularly in Europe. It is the effort to modernize our forces, to make them effective, to maintain a sense of solidarity with our allies, and to do all of this in such a way that we are able, hopefully, to fight effectively with conventional forces if a fight should ever occur before resorting to nuclear forces that makes the problem a complex and demanding and difficult one.

I think former Secretary of Defense James Schlesinger often states this problem very well—the problem of the alliance and deterring conventional war being at the heart of our strategic nuclear force dilemma. I very much agree with him.

We tried to strike that theme in the Scowcroft Commission report by saying in the beginning we were trying to deter war, not nuclear war in isolation.

Senator WARNER. My time is up.

Thank you.

Mr. Hart?

INFLUENCING U.S. FORCE STRUCTURE

Senator HART. Mr. Sloss, I understood you to say that the Soviets have had some success at influencing our force structure unilaterally.

What exactly did you have in mind?

Mr. SLOSS. The case that comes to my mind in particular, Senator Hart, has to do with the ABM. Let me describe my perception of the ABM Treaty and how it has operated.

The ABM Treaty is a treaty that is completely equitable in its terms. The Soviets have, in my view, fully exploited what was permitted under the treaty. I think we generally recognize this fact now at least a little bit more than a few years ago.

The United States chose not to pursue very vigorously a research and development program. Many people make important and valid arguments on that point.

We also dismantled our air defenses on the belief that both sides agreed not to have defenses. In short, I think the Soviets interpreted the ABM Treaty to endorse everything that was not otherwise banned and we interpreted the ABM Treaty as not being an antiballistic missile defense, but anti-defense in general.

Senator HART. Did we do that because we felt it was the wise thing to do or because we felt the Soviets wanted us to?

Mr. SLOSS. I think many people felt it was wise, but many people also felt there were not going to be any more defenses because we had signed a treaty abolishing defenses.

Senator HART. Were there any other instances besides the ABM where they have had that kind of success luring us into a false sense of security, or whatever?

Mr. SLOSS. Again, it is a mixture of conditions, Senator. The long debates that we have had in our country over this missile system, the MX that we are talking about, were at times influenced by the prospect that we might get an agreement limiting them.

It has been influenced by a number of factors, but I think the prospect of agreement has been a factor which has entered into the picture in the long debates that we have had on the MX missile.

Senator HART. That may be your perception as one who is involved in the past decade. I don't share that view.

I think it was the strong suggestion that the Soviet influence has been successful in getting us to shape our strategic deterrence to their interests and not to ours. I think I have a different reading of both the MX and the ABM history.

Mr. Woolsey, all of the programs that come under the umbrella of force modernization are presented to the Congress and the American people as necessary for security.

Do you agree with that and if so, what is negotiable? What system in that panopoly or existing or planned systems are up for negotiation?

Mr. WOOLSEY. Senator, let me say by way of preface that since I leave Friday to go over and take part in the negotiations and since this is a public hearing, I feel somewhat constrained to rather strongly support the whole spectrum of the U.S. strategic force modernization.

I think quite apart from Leon's statement about bargaining chips, I very much agree that if one, particularly publicly, designates a system as a bargaining chip or available only for bargaining or says that the President wants the program only for bargaining purposes, by saying that, one helps to undermine political and other support necessary for it to be used as such.

If by the same token one designates something as wholly and absolutely required under any and all circumstances, then one is implicitly saying it is not available for negotiation.

My view is that the program as a whole deserves support and that all parts of it, I am told, are subject to discussion in any case.

So, I am going to try to avoid drawing any clear and bright lines between systems which I think are negotiable and those which aren't.

I will only say that both in the Commission report and in my own personal view, the single most important part of the U.S. strategic modernization program is the command, control, communications and intelligence.

I believe the steps to modernize and make survivable the various aspects of the U.S. strategic command, control, communications, and intelligence systems, both those that took place under the Carter administration and those that are continuing and have been moved along with the administration, are of extraordinarly high importance.

If I were to take one set of things that I think is especially important, it would be those.

Senator HART. My recollection is under SALT I and SALT II those kinds of capabilities were never subject to negotiation on either side, unless I am missing the point.

Mr. WOOLSEY. That is generally right. They tend to fall into trouble principally or virtually exclusively because of budgetary problems, not negotiations.

SILO BASING POLITICAL DECISION

Senator HART. Do you agree or disagree with General Scowcroft's statement at the time of the press conference that the decision to recommend silo basing was a political one?

Mr. WOOLSEY. It was a mixed political and strategic one. The way I would say it would be that we have in many ways in this country, I think over the years, attempted to draw a very clear, bright line between strategic, in the sense of technically strategic, decisions and political decisions. One thing we tried to do on the Commission was to deal up front, so to speak, with the fact that politics and strategy are very closely related to one another, they are not the same thing, but to some degree they overlap.

I consider one important part of the strategy to be the degree of solidarity which the American government, both the Congress and the executive branch, can bring about in coming to a common position on strategic forces and other military programs.

Senator HART. I think the context of the statement was not international politics; it was domestic politics. He was talking about the political resistance to a mobile basing mode and that he thought in terms of domestic policy. That is why the Commission ended up with silos.

Mr. WOOLSEY. I have not heard it expressed exactly that way. Let me say what the considerations are with respect to the small missile and basing.

I believe the rationale for it being acceptable to proceed with silo basing for the MX is the one I gave in my opening remarks. I think either Minuteman in Minuteman silos or MX in Minuteman silos is adequately survivable when viewed in the whole context of the U.S. strategic forces for a number of years, but in time we should move away from such basing.

With respect to how one moves away from such basing into mobile systems, there are, I believe, several potential ways to go. One would, I think, raise political problems from the point of view of so-called interface with the public and that is the road mobile small missile. I don't know that those problems are insurmountable.

But the fact that there would be some people who would politically oppose having ICBM's on public highways, I think, is something that we should and did take into consideration.

I know there is a reasonable degree of disagreement, certainly on this committee, about how severe that political problem would be.

Senator Glenn and I have talked about this many times. But I think there is some political question about a road mobile basing of small ICBM's and how difficult those questions would be is certainly a matter of judgment.

I think certainly the most politically simple way to base a small ICBM would be to put it in a silo somewhere completely outside and leave it alone. But that tends to raise the long-term problem of survivability of fixed points on land that I think will be a very difficult one by the late nineties.

There are intermediate cases of political difficulty, or lack thereof, such as basing a hard mobile ICBM on military reservations in peacetime and moving it off those reservations only in the event of actual attack. Another one that I am particularly interested in, and I say I am sorry I don't see the Air Force investigating right now, would be basing a small mobile ICBM in a hardened mobile launcher within the fences of old Minuteman sites and flushing from those old Minuteman sites in case of tactical warning of attack.

There is a range of political difficulty with the different ways of basing a small missile and in terms of having to deal with the public. I think the most difficult political problem is caused by being the most interactive with the public, but Senator Glenn has argued persuasively, and I think there is something to it, that even that mode of basing might well be acceptable if the political leadership were properly exerted on it.

Senator WARNER. I am glad you brought up the fact that the C^3 system had primary emphasis on the part of the administration. Indeed, it emanated from the subcommittee when Senator Culver was chairman and I was ranking minority member.

Senator Wilson?

Senator WILSON. Thank you, Mr. Chairman.

Mr. Woolsey, I would like to pursue a little further the question. We have had some confusion of the term in our discussion about this weapon and the entire subject of strategic theory and its relationship to arms control.

LAUNCH UNDER/AFTER ATTACK

You said that you draw a distinction between launch under attack and launch after attack.

Will you clarify that?

Will you also address it under another term, launch under warning.

Senator WARNER. If you can give those three definitions that you used to carry it out, it will be helpful.

Mr. WOOLSEY. I think two are relatively clear. The third has always been somewhat ambiguous to me.

I think launch under or launch on warning has always suggested to me the launch of nonrecallable nuclear weapons, particularly ICBM's, based solely upon sensor information, perhaps many sensors, but nonetheless, based upon information that our sensors and warning systems would acquire prior to any detonation on American soil.

That is what launch on warning means to me.

Launch after attack is what we call in the Scowcroft Commission report the sort of scenario I was describing in my opening remarks, a launch, again let us say of ICBM's, only after there had been actual detonation on American soil.

I mentioned in those opening remarks why I thought the latter would probably be the case in the case of any planned Soviet attack which involves a simultaneous launch of Soviet ICBM's and Soviet submarine-launched ballistic missiles; this is because the submarine-launched ballistic missiles, with a short time of flight, would be detonating on U.S. bases or command and control centers some 20 minutes before a main ICBM attack would arrive on our ICBM fields.

In those circumstances, if ICBM's were launched after Soviet submarine-launched missiles had detonated on American soil, I would call that launch after attack. To me that is a very different thing from a launch on warning.

Now, the military and many parts of the strategic community, for reasons best known to themselves and which have always been unclear to me, like to use the phrase "launch under attack." I consider that to be an ambiguous phrase.

I think you can find people who mean by it launch on warning and people who mean launch after attack and it causes no end of confusion as far as I am concerned. But there is perhaps one reason for that confusion and it is in the point I made at the closing of my opening remarks—that from the point of view of our public posture as a nation on this issue there has always been a certain studied and planned ambiguity about when and how U.S. nuclear weapons would be launched.

I am not talking, I hope, about our real policy, but rather how we describe this publicly. We are a free and open society—the press is present in this room, for example and they were presumably present this morning when General Davis was testifying—there are international communications, and the Soviet Union is perfectly willing and able to read what we say here. Therefore, any description of the U.S. policy in terms of "launch under attack" I think might be taken as "launch on warning" and it might be taken as "launch after attack."

Frankly, I don't know this morning—if there was any ambiguity—whether that was a studied or unstudied ambiguity. Since I was not here, I will let you decide that.

Senator WILSON. I think it became clarified and I think in the process it was useful because so far as this afternoon's discussion, the terms that you have chosen mean that, in your view, and I gather that of the Scowcroft Commission, there is no necessity from the employment of MX to change our policy which has been one of response after attack, of launch after attack.

Mr. WOOLSEY. Again, Senator Wilson, setting aside this studied ambiguity, if we assume for the purposes of this question that it has been all along the policy of the U.S. Government to launch only after attack, that is correct. It is my judgment that the deployment of 100 MX's in Minuteman silos does not require the changing of that policy.

Senator WILSON. Thank you, Mr. Woolsey.

Mr. Sloss, I think this is an excellent paper. It is a very succinct presentation. I don't know if Mr. Woolsey has had an opportunity to read it.

I will just ask you parenthetically do you find yourself in agreement with Mr. Sloss.

Mr. WOOLSEY. I frequently find myself in agreement with Mr. Sloss. We have known each other for many years. I listened to his summary, I have not actually read this. So, if you will forgive my not signing on any dotted line, I will say in general I agree with it.

Senator WILSON. I will ask him a question while you review it.

I think the real guts of the debate that is transpiring now with respect to MX is responded to in your points 7 and 8, in the whole paper, but I think you really focus on it in 7 and 8 because I hear a number of my colleagues veering away from support of MX because of their concern about its vulnerability.

I think that you said you view it as an interim measure because of the possibility of hardening and possibility of deploying defensive technology in the future and, in any case, if you feel those prospects are not as promising as you find them, in any case, we cannot afford the luxury of not having some kind of counterforce to respond to the SS-18.

Mr. SLOSS. That is right.

Senator WILSON. The other line of argument that I hear frequently is that we can forget about MX and rely entirely on the small mobile missile.

You said in paragraph 7 on page 5: "We can anticipate at least several more years' delay before the small ICBM or some other less vulnerable alternative is ready to deploy."

I gather, although I was not present, that was the response that General Davis made this morning when Senator Glenn asked if that was possible and the Air Force pressing the button to accelerate the program and in fact unwisely so.

You also made the statement there are still some unanswered questions about the small ICBM Program.

Assuming, as we all do, that there is a great deal that is attractive in the concept of mobility, one of the things that seems to me is an unanswered question is the points that Mr. Woolsey has made with respect to the likely political resistance, having a semi pull up next to you at the stop light carrying a small missile.

So, I think he, probably wisely, has decided that mobility needs to be off-road mobility. Even at that, I would think one of the questions is what happens to your promptness of response with a small missile if you go off road? I don't know what the answer to that question is.

I would gather we would sacrifice something in the way of accuracy and something in the way of promptness.

Mr. SLOSS. I am not an expert on the details of the system, but I have some confidence that those are problems that will be tough problems, but problems that can be solved.

After all, we expect to get very high accuracy of submarines operating at great distances. But those are among the factors that lead me to believe that this small ICBM is not going to be something that will start cranking out like sausages in a few years. There will be a lot of complex problems.

I understand the Air Force is already running into a number of those. So, I don't view these as necessarily insoluable problems, but I think they are nontrivial problems which will take time to solve.

The point I stress to the subcommittee is that we ought to be very realistic about the time that it will take to develop a new

system. We ought to look at our experience in the past and not assume that these two systems are comparable in kind.

Senator GLENN. Would the Senator yield for a question?

Senator WILSON. Yes.

Senator GLENN. In talking to some of these people, the question you are asking, there are a couple types of guidance systems.

One, do you have to have a presurveyed site and update the exact elevation, the exact coordinates you want, update the system before you go or can you take certain latitudes there and update with star sights and things like that enroute?

We have a couple of systems here.

Senator WILSON. Unless you had a presurveyed site, you would be losing time.

Senator GLENN. We could have a million presurveyed sites in this country in the back woods, or wherever you want to pin this thing and probably update with as good accuracy as in the silos.

Senator WILSON. But you would have security problems.

Mr. Chairman, are we going to have a second round with these witnesses?

Senator WARNER. We will remain here this afternoon for a reasonable period. We do have a second panel. The questions are germane and very important and I want to accommodate the members as best I can.

I presume the witnesses will be able to extend their remarks.

We will now turn to Mr. Levin.

Senator LEVIN. Thank you, Mr. Chairman.

ABM TREATY

Mr. Woolsey, the Scowcroft Commission in its report, in a later report, the major one, ICBM, said that the ABM Treaty was one of the most successful arms control agreements.

Would you agree with that?

Mr. WOOLSEY. In principle, yes, Senator Levin. I supported the treaty and I think its negotiation was a success at arms control.

I would add, however, that it is only successful if it is observed by both parties and some of the recent Soviet steps, in particular the construction of the Krasnoyarsk radar, are serious problems with regard to that treaty.

Senator LEVIN. The Scowcroft Commission also stated that the strategic implications of ballistic missile defense and criticality of the ABM Treaty to further arms control agreement dictate extreme caution in proceeding to engineering development in this sensitive area.

Would you agree with that?

Mr. WOOLSEY. Yes, I think that is true. I think we are some years away from development of a system under the SDI Program. Paul Nitze and others in the administration, Deputy Secretary of State Kenneth Dam and I believe the January White House white paper on SDI have all spoken in terms of the importance of any SDI system having technical effectiveness—being technically sound, essentially—being survivable, and being cost effective at the margin.

I think all of those criteria are important and to me extreme caution is a perfectly fine characterization of those read together.

Senator LEVIN. General Scowcroft in an interview said that as a practical matter, it would be very difficult to induce the Soviets to reduce their offensive forces if they face the prospect of strategic defense for which they might need the offensive forces to penetrate.

Mr. WOOLSEY. It is a complicated question, Senator Levin. I think the three-step approach which has been described—that is, in the first phase of negotiations seeking to ensure that the ABM Treaty is observed and that strategic offensive forces are reduced—is a fine package and a fine initial approach.

What would come after that in any second phase by way of transition as the administration has described it, to a different balance of offense and defense, is a difficult question and my crystal ball is rather cloudy with respect to exactly how we would work in such a world.

As I said, I am going to be involved in negotiations and I think that that framework is one I am certainly willing to work within. I have a little easier time seeing how we work within the first one at this point than the second and third.

Senator LEVIN. I am not sure I understand your answer. I know you will be at the negotiations, but wouldn't you agree that as a practical matter, now quoting General Scowcroft, it will be very difficult to induce the Soviets to reduce the offensive force if they face the prospect of strategic defense for which they might need the offensive force?

Won't it be difficult as a practical matter?

Mr. WOOLSEY. I think what I have to say here and now is that our first effort is going to be to get them to reduce those offensive forces and observe the ABM Treaty, and that the SDI Program as it has been described is a research program, and that as far as further stage or further transition is concerned, I can't foresee or describe to you right now how such a transition would be brought about.

ADMINISTRATION POSITION AT GENEVA

Senator LEVIN. Have you been briefed on the administration's position at Geneva?

Mr. WOOLSEY. No. The meetings which are deriving that position have been taking place in the last few days. They involve senior officials within the administration, often working together directly with the President.

I think the rest of us who are delegates will be having discussions on those over the course of the next few days and at the beginning of the time when we get to Geneva.

Senator LEVIN. Without having the advantage of those briefings, is it your understanding as of this point that the deployment of the SDI, assuming research shows it be to feasible, is a negotiable subject?

Mr. WOOLSEY. Senator Levin, I think I would have to defer to Max Kampelman on that.

Frankly, as a delegate-at-large and one of a number of delegates, I am reluctant to try to parse an administration position on that because there have been several different statements, some with

slightly different nuances. I don't think I am really the one to try to give you an administration position on it.

With respect to the actual negotiating posture and the precise negotiating position we will adopt next week, that is something that is being worked out by Ambassadors Kampelman, Glitman, and Tower now with the senior officials in the administration and the rest of us on the delegation will be learning about it in the next few days.

ABIDING BY SALT II LIMITS

Senator LEVIN. Let me move to a different subject. General Scowcroft also has said that the Soviets have been abiding by the SALT II limits. It seems to me that it is in our interest to do so as well.

Do you agree with that statement that we ought to abide by the SALT II limits or not act in any way to undercut those limits?

Mr. WOOLSEY. I believe that some of the SALT II limits, the quantitative ones, one can make a reasonable case that most of those have been well observed by the Soviets. But there are certainly others, not only with respect to the ABM Treaty, but with respect to such matters as testing the SS-X-25, which are quite questionable and exactly how we should respond on that whole range of issues, some of which are now before the Standing Consultative Commission, seems to me to be a complex matter.

SALT II would have expired, had it been ratified, this coming December. I am afraid again on that issue I have to step back and wait to see how these issues are going to be handled and what leverage people want to exert before the Standing Consultative Commission about getting Soviet compliance.

I don't think I would aid the negotiating process by telling you here and now what I think as a delegation we ought to say on that point.

MX CHARACTERISTICS

Senator LEVIN. Mr. Sloss, you have indicated that the MX has unique characteristics. If, in fact, they are vulnerable to a Soviet first strike, what is the chief value of rapid or accurate response?

If your retaliatory weapons presumably are considered vulnerable, what is the value of their uniqueness?

Mr. SLOSS. I will say two things, Senator Levin.

First, as I indicated in the statement, I am not comfortable with the idea that they are vulnerable. I would be much happier if they weren't.

What I was addressing was the utility of those weapons entirely, what unique capability they have against certain types of targets we have to attack. I would say there is a range of possible scenarios that have been postulated.

You know, the standard scenario that the Soviets will strike against our ICBM's and probably our command and control, and they will be quite successful in that attack and, therefore, a lot of weapons will be lost. That is not an unusual scenario. It is not the only possible scenario.

In any possible scenario, quite a few ICBM's might survive. In others, such as the one Mr. Woolsey mentioned, if they should

choose to attack with their submarines first and attack against bomber based and command and control and we launch, in the term he used, after attack, then a large number of ICBM's would survive and they would be effective.

Senator LEVIN. Thank you.

Assuming we talk about a conceivable scenario, do you think it is conceivable they would launch against our bomber bases and leave our ICBM's untouched?

Mr. SLOSS. No. It is not what I said. I don't think that is what Mr. Woolsey said.

Senator LEVIN. I thought you said no.

Mr. SLOSS. First of all, I think the important thing here is that having these two weapon systems creates a dilemma for the Soviets because they want to get at the bombers before they are launched. If they want to get at the bombers quickly, they will use the weapon with the shortest flight time which is their SLBM's.

During the time they are attacking with SLBM's, they have to assume that we might launch the ICBM's. In the first instance the value of that situation is that it strengthens deterrence. It makes the problem more difficult for the Soviets.

I don't think they would attack the bombers without attacking the ICBM's, but I think they might choose a mode of attack in which there would be some period of time between the attack on bombers and the attack on ICBM's.

If they don't do that, then they will have to give us warning when the ICBM's are launched and there is some prospect of taking action against the submarines.

The important thing from my point of view—I think the name of the game in the first instance is to deter—the important thing is that it complicates their problems and makes it less likely that they would feel confident that they could achieve their objective.

Senator LEVIN. My time is up.

Senator WILSON [presiding]. Senator Glenn?

Senator GLENN. Thank you, Mr. Chairman.

POLICY OBJECTIVES

This morning General Davis was here and talked about our policy objectives. One of them was to make the Soviet planning most difficult. I agree with that objective. We all do.

If you were a Soviet planner, what do you think would give you the most worry?

I will let my biases hang out in advance by continuing the question and saying do you think you would be worried more about trying to target spots that are already known to you and have been targeted for some time or trying to target targets of a unique location?

Mr. WOOLSEY. I am glad to play straight man on that. I think if I were a Soviet planner, I—at least on those two—would like to deal with targets of known location, but I think I would also say that if I were a Soviet planner, I would think that I would also not want nuclear war, I would want to try to achieve my objectives without it.

My first objective would probably be to try to divide the United States from its allies and to achieve my objectives without force, if possible, and with conventional force or less than nuclear force, if necessary, and with nuclear force last of all.

So, I would regard as most damaging to my Soviet planning those steps which the United States took to solidify itself with its allies and to deter my ambitions that way.

I think that some of the steps that we have taken to modernize our intermediate range nuclear forces in Europe and that we might take with a tactical ballistic missile defense system for NATO would be the sorts of things that I as a Soviet, would least like to see.

U.S. SOLIDARITY WITH ALLIES

Senator GLENN. You mentioned earlier in your statement a previous remark to the effect that it was important that we have U.S. solidarity with our allies, and so on.

I don't think the Soviets are going to be misled—they respect strength, period—they are not going to be misled by saying this is just a bargaining chip or something else. They look at our force and see exactly what its capability is and how guaranteed the response is if they happen to make the first attack.

While I agree that we want all the solidarity we can get, I think the Soviets will respect actual strength as they assess it and are not going to be led astray by other means.

I was looking at some of the cost figures on this. We presume we are going to be able to superharden some of the silos, and so on.

Do you gentlemen have an estimate or a guess of what the silo superhardening is going to cost?

Mr. SLOSS. I don't. I suspect your next witnesses may have more information on that. I don't have the information.

Mr. WOOLSEY. I haven't seen one recently, Senator Glenn. I remember figures from the Scowcroft Commission 2 years ago ranging up in the tens of millions of dollars per silo for the true superhardening.

I must say that—although I believe such a step would buy time and would improve the survivability of whatever is based in the silo, whether it is an MX or a small single warhead missile—that the march of accuracy is sufficiently resolute, for both United States and Soviet strategic forces, that there will come a time—and I think it will not be before too many years—when single fixed points on land, however hard, will not be the method of choice as a place for locating new strategic forces.

Senator GLENN. I know we have another panel coming up here shortly and I don't want to carry this too far here, but let me go a little bit further with this anyway.

What General Davis and I came down with as sort of a difference of opinion this morning was mainly just on the time base in which these missiles were required.

I am in favor of force modernization, lest anybody get the wrong idea. I am for that, but my problem is that while we have some 2 to 4 years, depending on whose estimate you may want, as the difference in IOC or FOC between the MX and the mobile missile that

would have virtually the same characteristics and capabilities, we are just talking about a time difference here of that, of something like 2 to 4 years depending on whose estimate you want on what can be done in bringing mobility on in a faster time period.

Do you feel it is worth going ahead with the MX on that basis?

All we are talking about is that time period having that missile as opposed to developing what would be a better deterrent at cheaper cost on down the road?

Mr. SLOSS. I think that is an important comparison, but it really does not seem to me to tell the whole story because what you want to compare is the appearance of comparable capability.

If, indeed, a small missile is available 2 to 4 years after we begin deploying 10 warheads at a crack in the MX—there are pluses and minuses to that as you well know—we are going to be employing one warhead at a crack in the small missile, so by the time you have x number of warheads employed, it seems to me that is the relevant comparison.

I am not prepared to make that in my head, but it seems to me it will take longer to get to a comparable capability.

SOVIETS MOVING TO MOBILE CAPABILITY

Senator GLENN. Mr. Sloss, the Soviets are obviously moving to a mobile capability and stressing that in their future developments.

How do you see that?

Mr. SLOSS. As I said earlier—I am not sure whether you were here at the time—what I perceive is the Soviets employing a whole range of defensive measures to make our target problems more complicated.

I got interested in this, looking at the points of view as a United States' planner, when I was working with the Pentagon on targeting policy. I see that as part of a whole panopoly of things that they are doing to complicate our targeting problem, most of these things are defensive.

Mobility not just for the strategic forces, but for their general purpose forces, forces at a certain stage of warning moving out of their bases which are the things we target, and therefore remove much of the value of targets we cover.

Of course, they have increased over the last decade the number of strategic weapons that they have in submarines. They use concealment and air defense to protect key facilities. I see this as a part of a trend in which the Soviets are exploiting defenses to complicate our targeting problem.

That does not mean that we don't have an assured destruction capability, but it is getting more difficult and it is getting less certain. We are not posing similar problems for the Soviets in the same way. We have hardened our missiles.

Jane's now says publicly that the Soviets have the hardest missile silos in the world. So, they have caught up and to some extent surpassed us. If you compare our counterforce capability against their hardness, there is some advantage there.

I see this as part of a much broader picture and one that I find concerning us if we let it continue. They are providing us with growing uncertainties. I don't think we are doing the same thing.

Senator GLENN. The greatest uncertainty to me is not knowing where to shoot, not knowing where the thing is going to be. I hate to play a broken record around here, but the one reason our submarine systems are so good is that they have a degree of freedom there that can't be kept up with. I think we need to be doing the same thing on land if we can.

I don't think the upgrading of a guidance system, as Senator Wilson talked about a while ago, I don't think that is a problem at all, not from my talking with the people who will do the design on some systems like that.

Mr. Chairman, I know we are looking forward to another panel here so I will end my questions with that.

Senator WARNER. Thank you, Senator.

Senator Wilson, do you have a followup?

Senator WILSON. Yes, I do. I thank the chairman.

Gentlemen, it is clear that the Soviets have already gone mobile, with the SS-24 and SS-25. Clearly there is desire in this country to go mobile and it is the recommendation of the Scowcroft Commission that we engage in active research and Congress has taken that recommendation considerably further.

Let me just ask you, if the Soviets do not agree to a treaty that limits warheads, are we in a position where we can afford not to MIRV the small missile?

Mr. WOOLSEY. I will start with that if you want.

Senator Wilson, I think that if the Soviets do not agree to an arms control treaty that would reduce the level of offensive forces, we need to have a range of possible options available to us.

I know that reasonable people suggest that should include enhancing MX survivability along the lines of the way Leon's statement at the bottom of page 5.

Others talk of MIRV'ing the small missile and perhaps delaying it in order to be able to increase its weight for penetration aids and the like.

My own view is that the best policy with regard to the small missile is to continue on the course of an early 1990's IOC and to keep the weight in the range that has been proposed by Congress, to work on a maneuvering reentry vehicle by way of avoiding the potentiality of upgraded Soviet defenses, and to assess a range of possible basing modes. The most interesting ones of these to me, are mobile, including not only the road mobile and the hard mobile on military reservations, which are in the Air Force Program and have been described here, but also the possibility of basing within the fences, as I said earlier, at Minuteman sites and being flushed on warning along those section lines in several different directions from those sites.

I believe that the importance of having a small missile program is great. I believe that one does inherently reduce the attractiveness of the target by having it be a single warhead and also one increases the potential types of mobile basing by it having a single warhead and weighing in the range of 30,000 pounds.

Perhaps more importantly, even in the absence of an offensive arms reduction agreement, I do not see it necessary for the United States to match the Soviet ICBM force ICBM warhead for ICBM warhead. I think an overall balance in deterrence is what is re-

quired and that having a survivable sea-based force and survivable modernized bomber force together with an ICBM force—as I said, hopefully one that contains 100 MX's—that contains perhaps a relatively small number of small ICBM's with a warm production base is most important.

What I would like to be able to do with a small ICBM force is use it to hedge against the possibility of Soviet improvements in antisubmarine warfare so that if we should grow concerned at some point about the survivability of the submarine force, we could step up the production line and deploy more of the small ICBM's.

Personally, and I think this is an issue reasonable people can disagree about, I am opposed to the set of suggestions which have come from one or two quarters recently that we MIRV the small missile, increase it weight, insist only on the AIRS guidance and not look on any of the other guidance possibilities, and avoid looking at basing it on mobile launchers within the Minuteman fences.

I think the course I haved described is the better course for the small ICBM.

Senator WILSON. I will say in a visit to three different contractors that are working on the problem I am led to believe that they think there is incompatibility between the weight restriction, range requirement, and ability to add penetration aids and ability to provide some laser insulation on the booster.

I don't blame the Scowcroft Commission. In this instance it seems to me we are going to reexamine that.

Isn't the likely Soviet response—someone asked this before—isn't the likely Soviet response even to a single warhead, small mobile missile in the range of even 500, much less than 1,000, that would match 100 MX's MIRV'd with 10, going to be a tremendous increase in MIRVing on their part in order to achieve the barrage effect that is necessary to deal with the centralization of these warheads?

Mr. WOOLSEY. I think that probably the figure of merit that the Soviets would need to concentrate on for a barrage attack would be equivalent megatonnage, and they have a pretty broad range of possibilities.

They have a very large throw-weight for barraging acres of land, regardless of whether they do it with a few large warheads or with a large number of MIRV'd warheads. I think there are a number of ways they can do that within their overall throw-weight.

The key thing we want to concentrate on is having a hardened mobile launcher and having one that is deployable to a relatively large land area. There is a tradeoff between hardness and land area.

Senator Glenn has spoken of the possibility of a road mobile system. With that, using a very large land area, one does not require a particularly hardened launcher.

On the other hand, if you are going to stay completely within the confines of, let us say, western military reservations, you need a launcher of substantial hardness.

To me the interesting basing modes are those that would minimize security requirements and manpower requirements by staying inside military reservations—whether those are large bases such as White Sands or Nellis or small Minuteman fences in the Northern

Great Plains—during any time except when the force was actually under attack, and would then flush off those reservations onto roads once one had tactical warning of actual attack.

I have seen some statistics recently that would indicate that one could get into the range of using 20,000 square miles by using and flushing from several of the largest military reservations within the flight time of attacking Soviet SLBM's. Also one could use perhaps double that land area by staying within the fences in the Minuteman fields and flushing away from those once you had warning of a Soviet SLBM attack.

To me, those types of deployments which try to hold down the manpower and the cost of security by staying in secure areas in peacetime and then flush upon tactical warning to a wider area are the most interesting.

I must say that I think some of the very large estimates of manpower cost and security costs which one got early from the program office with regard to the Small Missile Program are probably costs which could at least in part be avoided by the types of basing modes I have described.

Senator WILSON. Mr. Sloss, do you think we can afford not to MIRV?

Mr. SLOSS. Yes, I think we have other options.

Senator WILSON. Let me ask it this way.

Do you think that that range of options that he described, do you think that range of options should not include the possibility of MIRVing?

I am concerned that we have imposed a design constraint upon this small missile that it is going to be incapable of performing the role we are asking it to perform including having sufficient thrust to carry three warheads if we decide on that.

GROWTH OF SIZE OF MISSILE

Mr. SLOSS. That is the question I wanted to address. I share that concern. I understand the impulses that cause this subcommittee and others to be concerned about the growth of the size of that missile because we are looking for a missile that will be genuinely mobile and which we can protect.

If it turns out to be a big beast that we can't make mobile, we have defeated the purpose.

It also seems to me that if we have to put a lot of warheads in that missile and create another valuable aim point, we have defeated the purpose. But I have concern about the arbitrary limit on a missile throw-weight because I think we have to contemplate two trends.

Again, I come back to the Soviet target system which is what I have spent a lot of time looking at. I think we have to contemplate the possibility of a growing Soviet missile defense. We may be able to bring that under control through negotiation, but I am not optimistic about that and I think we have to have enough payload in any new missile to be deployed so that we can penetrate defenses.

It may be that we can do that with a maneuvering reentry vehicle, but that takes payload, too.

The other thing is the potential hardness of Soviet targets. While I agree with my friend, Jim, that as accuracy improves, it is going to be harder and harder for any fixed target to be invulnerable, if you look at it from the point of view of the operational plan—I don't know if you talked to General Davis about it—if you look at the point of view of the scientist, he says you will be abe to get 50-foot accuracies and we can kill anything.

If you look at it from the point of view of the operational planner that has to have high confidence in killing a target of uncertain hardness, he would like to rely a little bit more on yield even though the scientist may tell him we can get that 50-foot accuracy.

What that means, of course, is that half the weapons will fall within a circle of x feet. We have expressed accuracy in terms of probability, as you know, because we can't be sure that every weapon is going to land with precise accuracy.

So, the fellow who has to do the targeting would like to have a little hedge there even if the scientist tells him we are going to get this great accuracy. That is another argument for not freezing in the design to yields that we may find it difficult to live with if the Soviet target system gets very hard.

I share the principle expressed in the question. We want to keep this missile mobile, but we need to have a little flexibility in the design criteria so that we can balance these various considerations.

Senator WILSON. Assuming that the basing is hard mobile within a military reservation, in time of real crisis, is an American President going to be willing to flush or is he going to see that as a dangerous escalatory symbolic gesture?

Isn't he going to have to carefully weigh the effect of that?

Mr. SLOSS. Certainly a consideration, but at that point the Soviets are going to be flushing things like mad, including divisions and submarines and airplanes. It will take some nerve.

Mr. WOOLSEY. More importantly, Senator Wilson, I think the interesting deployments for the small mobile missile would be those that would keep it on military reservations until one had actually tactical warning of a Soviet launch.

Presumably once one had actual tactical warning of a Soviet launch at the United States, considerations with regard to public interface and use of the highways and so forth—whatever else they might be in peacetime or in a crisis short of that launch warning—would go away.

I must say that although this is a subject which is full of minefields and reasonable people can differ about this issue, to put it mildly, my principal concern with respect to the small missile is rather different than the one you stated.

I am concerned that—by coming up with all sorts of requirements such as laser hardening against the Soviet SDI systems which would not exist until sometime well into the 21st century, and so on—that some people are pushing to increase the weight of the system and potentially to have it delayed thereby, and that the consensus will break down. People will begin to blame the Air Force and others for not supporting the small missile and the entire consensus—which is fragile, at best—regarding both the deployment of the MX and work on deployment of the small missile will fall apart.

In other words, I think one of the things that people who support the MX deployment, as I do, should try to do is to insist that the small missile program be a lean and effective one and that it move along in a reasonable way and not appear to be delayed or made very large or very heavy or very expensive, because I think that could contribute to a complete dissolution of the consensus we tried to build 2 years ago.

Senator WARNER. If I might ask a question and then we will go to the next panel, I will quote from the Scowcroft Bulletin:

"Abandoning MX at this time in search of a substitute would jeopardize, not enhance, the likelihood of reaching a stabilizing and equitable agreement. It would also undermine the incentives to the Soviets to change the nature of their own ICBM force and thus the environment most conducive to the deployment of the small missile."

Mr. Woolsey, do you still subscribe to that conclusion?

Mr. WOOLSEY. Yes, I do.

Senator WARNER. Do you, Mr. Sloss?

Mr. SLOSS. Absolutely.

Senator GLENN. One further remark on the question Senator Wilson was raising here about whether a President would be willing to put these forces out and deploy them.

I would think that would be an excellent use of this force, as a matter of fact, to send a message that we are serious about this whole thing and you are going to get it right back if you make any mistake. This would only be done in a crisis situation. I see it as a way of sending a strong message. So, the answer is "yes."

No. 2, on the limitation of size, I don't think there is anything magic about 30,000. I think the reasons why it was picked is, No. 1, people said we could do it first. It was doable. I don't recall whether it was a helicopter transportable lift capability here that we talked about at one time or not. It may be, but helicopters can lift 30,000 or 35,000 pounds or so and would give it that transportation capability if you want to use that sometime.

Another one, as far as limitation on the roads, there would be no limitation at all. I checked back on the interstate highway system as to what it was designed to take. It was designed to take 275,000 pounds or something like that. This would only be 30,000.

We have a limitation on Safeway trucks, et al, of 75,000 or 80,000 pounds. So, if we want to put it in lighter vehicles and, say, remain on the road, then you could go quite well over the 30,000 pounds.

If you want to make it a panda base-type operation where you go off the road on soft terrain, then you would get into big problems and you want to keep it as light as possible.

Senator WARNER. You have to add the launcher system in the weight. My guess is, having sat through the hearings here for 7 years, try to preclude a second generation MX creeping up on us by way of development.

Gentlemen, we are most appreciative of your contribution to this hearing. It is an important one. You have been very precise and responsive.

Being members of the private sector, we recognize the sacrifice you are making. Your suggestions on this small missile is leave that program alone?

Mr. WOOLSEY. My preference would be to keep it in that weight range. I must say I don't state that with a hundred percent confidence. I think one should keep an open mind about these things.

Senator WARNER. Also don't try to advance it a year or two?

Mr. WOOLSEY. I would also suggest not trying to slip it a year or two.

Senator WARNER. We have a few questions which you can answer for the hearing record.

[Questions with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR JOHN WARNER

ICBM PROGRAM

Senator WARNER. "In your judgment, are the pace of, and design for, the small ICBM program consistent with the recommendations of the Scowcroft Commission?"

Mr. WOOLSEY. I have not made a recent independent investigation of the small missile program, but I believe that a single-warhead missile, in the range of 30,000 to 33,000 pounds, that is capable of mobile deployment and able to be deployed within the time envisioned in the present program, is consistent with the Commission's recommendations.

The most interesting basing mode of which I have recently heard would involve deployment on hardened mobile launchers at the Minuteman ICBM site. This would mean that a certain degree of security would be available from the existing fences around the existing silos and that the local farmers and ranchers who now have such silos on their property would see a deployment no more disruptive than that to which they have become accustomed. Such missiles would require tactical warning—i.e. warning of launch by Soviet ICBMs or SLBMs—in order to move out along the existing road network to achieve survivability. But if the missile and launcher are light enough to be able to use a substantial portion of the existing roads in the Minuteman fields, and if the mobile launcher can achieve the levels of hardness now being contemplated, such a deployment mode would permit utilization of an area about the size of West Germany. Barraging such an area to achieve the overpressures necessary to destroy the contemplated hardened mobile launchers would take a very great deal of Soviet equivalent megatonnage (for which throw-weight is a reasonable proxy).

There may be some utility in also considering deployment on existing military bases—particularly large ones such as Nellis, White Sands, etc.—but this would also probably require a missile and launcher light enough to use existing roads, including unpaved roads, for dispersal. Therefore, I believe that a substantial increase in weight for the small ICBM would be unwise. Perhaps a Maneuvering Reentry Vehicle (MaRV) program would add substantially to the missile's ability to penetrate potential Soviet ABM defenses and would do so without the weight increases that would be required to be able to deploy substantial numbers of penetration aids or additional reentry vehicles.

In sum, I believe that a relatively light, single-warhead missile, pursued on a steady program (without either pushing for an IOC in the late eighties or delaying until the mid-nineties), offers the best chance in the long run for maintaining a survivable and effective ICBM leg for the triad.

Senator WARNER. It is stated that "rough parity" in United States/Soviet strategic forces exists. Yet, when you consider the target base each side has to attack, a substantial disparity exists that favors the Soviets. Would you discuss this issue from your perspective?

Mr. SLOSS. Rough parity in strategic forces exists only if you apply the traditional numerical indices (warheads, launchers, megatonnage). I believe these measures do not provide an accurate assessment of the strategic balance. As I emphasized in my testimony, the Soviets have been vigorously pursuing defenses of all types for at least a decade and a half while the U.S. virtually ignored this area. As a result, many of the Soviet targets that we seek to hold at risk with our strategic forces in support of our strategic doctrine are less vulnerable to attack than similar targets in this country. For example, their missile silos and some of their command facilities are harder than comparable targets in the U.S. They are harder to find and are dispersed throughout their country. Additionally, they have a far superior air defense system which has some inherent BMD capabilities which further contribute to U.S. targeting uncertainties.

Our commitments to alliance partners create additional demands for our nuclear forces. We must extend a nuclear umbrella over allies that do not possess and indeed have foresworn nuclear weapons. U.S. nuclear commitments to the defense of NATO allies are more specific than those of the Soviet Union to the Warsaw Pact. Some argue that these U.S. commitments require a U.S. strategic force advantage which is surely not present. The implication of these asymmetries is the subject of much debate. I think they are significant, particularly because of the very important role nuclear weapons play today in extended deterrence.

Senator WARNER. You indicate in your statement that superhardening and active defense are options that would improve the survivability of ICBMs. In your view, do these options have different implications for the unique capabilities of ICBMs relative to our employment policy?

Mr. SLOSS. ICBMs should be survivable in order to ensure there will not be undue pressures to use them before we lose them in a pre-emptive strike. However, not all ICBMs have to survive. As long as they constitute a significant element of the triad we must be confident that a substantial portion can survive. We want to be sure an enemy does not believe he can destroy a large portion of our ICBMs in a surprise attack. This would increase the temptations for such an attack. As to the contribution of ICBMs to the triad, this was discussed in the hearing by both Mr. Woolsey and myself. The synergy of the three major triad legs that were described in the Scowcroft Commission Report and by Mr. Woolsey is particularly important in my view.

If you assume, as I do, that maintaining a triad is important and that the ICBM leg should be as survivable as we can reasonably make it, the questions of how to do this becomes largely a technical problem. Hardening, mobility and active defense all can play a role. The best mix involves considerations of effectiveness, cost and political acceptability (notably for mobility). The contribution of active defenses in this role is not yet well understood for we have neglected that technology for more than a decade. The SDI will help us understand what modern defense technologies could contribute to the defense of a range of targets, including ICBMs. I believe we will find that active defense can make a significant contribution. As ICBM accuracies improve even more, hardening alone—even super-hardening—is unlikely to prove an adequate solution, although hardening in conjunction with active defense may resolve a large part of this problem.

Senator WARNER. Your statement points out the unique capabilities of ICBMs. In your view, would small ICBMs also possess the unique capabilities that you cited? Are there advantages and disadvantages associated with a single warhead payload with respect to employment?

Mr. SLOSS. The main advantage of the small ICBM, of course, is the possibility of reducing vulnerability through mobility and reducing the value of any given target. We would like to create a situation in which an attacker must expend more missiles than he destroys in order to have confidence in achieving his objective. This would contribute to stability. However, achieving this objective requires deployment of the small ICBM in substantial numbers, for if there are only a few of them vulnerability will not be reduced—it may well be increased. If we deploy the small ICBM in sufficient numbers the cost of the system must be kept down. That seems to me an important factor.

Single warhead missiles provide greater flexibility from the standpoint of targeting. It is easier to tailor limited options with single warhead missiles than with multi-warhead missiles. However, the limited throw weight of the small ICBM creates inherent limitations against an expanded Soviet ABM defense. This is an important trade-off which must be carefully assessed before we proceed with the production of the small ICBM.

Senator WARNER. Why don't we take a 5-minute break and reconvene at quarter to 4 and have our next panel.

[Short recess.]

Senator WARNER. Mr. Secretary and generals, we will resume the hearing now and ask if you would take questions from our colleague, Senator Glenn, prior to your direct presentation.

Senator GLENN. Mr. Chairman, I appreciate that very much because I do have to go back to my office. I am sorry that I can't stay. I have some people coming in from out of town.

Senator WARNER. You have invested roughly 5 hours today in this hearing.

Senator GLENN. That is right.

Senator WARNER. Will you please proceed Dr. Cooper?

STATEMENTS OF HON. THOMAS E. COOPER, ASSISTANT SECRETARY OF THE AIR FORCE, RESEARCH, DEVELOPMENT AND LOGISTICS; LT. GEN. ROBERT D. RUSS, U.S. AIR FORCE, DEPUTY CHIEF OF STAFF, RESEARCH, DEVELOPMENT AND ACQUISITION; BRIG. GEN. GORDON E. FORNELL, U.S. AIR FORCE, SPECIAL ASSISTANT FOR ICBM MODERNIZATION, DEPUTY CHIEF OF STAFF, RESEARCH, DEVELOPMENT AND ACQUISITION, HEADQUARTERS, U.S. AIR FORCE

Dr. COOPER. Let me introduce my colleagues, General Russ who was here yesterday, and General Fornell who is our Special Assistant for ICBM Modernization.

Senator GLENN. Can you give in open session some of the figures we have been talking about, the cost of the missile itself if we go to the MX, what the per unit cost is going to be and also estimates, if you have them, on the cost of super-hardened silos which we are talking about if we go ahead with the ICBM?

General FORNELL. Sir, the procurement unit cost for the MX if they pick one off the middile of the line runs about $29 million a copy.

You are aware that we have 100 missiles planned for deployment. We require a total missile buy of a 223 which support the lifetime operational test as well as a logistics function of aging and surveillance.

Senator GLENN. That $29 million would not be supprt equipment or would it be a launcher? What would it be?

General FORNELL. That would be the missile itself.

Senator GLENN. What are we talking about for the missile ready to be fired, not in a super-hardened silo, but out there ready to be launched?

General FORNELL. With all the systems if we divided it out, we committed to the Congress, following the submission of the Scowcroft Commission report, a $16.6 billion program in 1982 dollars which covered the full 100-missile deployment in existing Minuteman silos. That includes all the research and development, all the production and the military construction facilities to support full deployment.

Senator GLENN. That would come out as $16.6 and that total number you are talking about is 223?

General FORNELL. Yes, sir, $16.6.

Senator GLENN. What would that figure out to?

General FORNELL. $74.4.

Senator GLENN. $74.4 million?

General FORNELL. Yes.

Senator GLENN. What are your estimates on superhardened silos to go along with this?

General FORNELL. Those are in the rough magnitude category at the moment because of the difference in design. We are running a fairly rapid test program now where designs are evolving. We have made some initial estimates for 50 silos at a total cost of about $9 billion.

I want to caution a little bit about those numbers. They are rough at the moment and part of an evolving design comparison that we are undergoing currently.

Senator GLENN. That would be somewhere between 180 and $200 million per hardened silo?

General FORNELL. Yes, sir.

Of course, that includes the research and development necessary to specifically design and qualify a silo for a given missile system.

Senator GLENN. That would be the overall funds spent to get the capability?

General FORNELL. Yes, sir.

Senator GLENN. That would be 74 and close to 200. We could say then it is going to be around $275 million per hardened silo filled with an MX ready to go?

General FORNELL. Yes, sir. Now, that is not part of a program as we have defined now. You are combining a basing technology program which is a research and development program to examine those technical uncertainties on basing technology, in particular hardness, with our current program of deploying 100 MX missiles in existing Minuteman silos at Francis E. Warren Air Force Base.

Senator GLENN. That is a very interesting figure. That means you get four per billion dollars roughly if we go that route and that hardness and it all works out the way we think it will work out.

Dr. COOPER. Senator, that is a very rough order of magnitude right now for the hardened silos. I think what we can say is that we are not talking about $100 billion for the 50 silos. We are talking about $10 billion. That might be $6 million or $12 million. We don't know. It is a rough order of magnitude.

Senator GLENN. That would be your best estimate at this time?

Dr. COOPER. Our best very rough estimate.

Senator WARNER. Theoretically if we proceed on that course, what percentage enhancement survivability would we obtain for that investment?

Dr. COOPER. Mr. Chairman, we need to take that question in closed session, if we can.

Senator WARNER. But it would be significant?

Dr. COOPER. It would be significant against today's Soviet accuracies.

Senator WARNER. Thank you very much.

Thank you, Senator Glenn for joining us.

1986 MX PROGRAM

We will now proceed with your direct presentation which is essentially the administration's case for the 1986 MX Program.

Dr. COOPER. Mr. Chairman, what we would like to concentrate on are the specifics of the program and give you a progress report updating what we told you last year. Like the bomber program, what you will hear I hope you will be pleased with.

Last year we continued to follow the recommendations of the President's Strategic Commission and as you well know, that involves developing and deploying 100 Peacekeepers in existing Minuteman III silos, developing and deploying a small ICBM and undertaking a very vigorous ICBM Basing Technology Program.

As I mentioned, our program continues to progress very smoothly. Since we last talked we have had four additional, very successful Peacekeeper shots. Our accuracies continue to improve and General Fornell will expand on that.

We now have tested a total of 7 out of a program of 20 in the Flight Test Program. In the way of production, it may not be apparent to most members, but we actually have a production line in place.

Congress authorized and appropriated funds for 21 Peacekeepers during fiscal year 1984 and those production lines now are up and running. We very much would like to maintain that momentum.

SMALL ICBM PROGRAM

As far as the small ICBM Program is concerned, we now have a fully staffed small ICBM Program office in place at Norton Air Force Base that is headed by Brig. Gen. Dave Englund who is doing an outstanding job. There are 200 people in place now and that program is moving smoothly.

We have levied 20 contracts to date and have had several vigorous competitions in the hardened mobile launcher competition. When we briefed you last year we had four candidates. We have down selected to two. We have picked contractors to look at an alternative guidance system, alternatives to AIRS. We have also had a down select in the propulsion area where we down selected to two contractors for each stage.

The small ICBM is a three-stage missile. We are now in that phase of the program where we have two contractors each competing for each stage. As it turns out, all four of our major propulsion houses are involved in that program. All in all, I think we can give you a very good report and we are off and running in our small ICBM Program.

Senator Wilson, we don't think it is too fast. We assure you it is not too slow. We think the program is properly spaced at this point, with the task we have been given.

By the way, Senator Warner, last year you asked if we could assure you that it would be compatible with the public highways and indeed it will be compatible with the public highways, although we hope we can maintain a hardness at such a level that we can keep it on DOD land.

We are encouraged by what we see to date in terms of what may be technically possible in the hardened silo area. We think it is possible to construct silos that will be significantly harder than today's silos.

The downside of that is that it appears they will be very expensive. All in all, as I mentioned on the Bomber Modernization Program, we are extremely pleased with our progress to date. I think we have a success story.

I would like to pass out a couple of kudos. I think Major General Casey who runs the Peacekeeper Program, General Englund and General Fornell have done an absolutely magnificent job with these efforts.

I think our problems right now are political problems which we have discussed and you have been discussing during the day. They

are not technical problems. That is not to say we have no problems ahead of us, because we do. But to date we have made fine progress in the program.

I would like to take the opportunity to again thank you for your support and ask for your continued support to help us remove the fence on the $1.5 billion in fiscal year 1985 funds and also we would like to seek your support for the fiscal year 1986 request for 48 Peacekeepers.

We have tremendous momentum in the program right now. We are in the production phase, and we would like from a programmatic point of view not to see that progress interrupted or momentum destroyed.

I could say more, but we submitted a formal statement yesterday. In the interest of time, I would like to turn it over to General Fornell to give his briefing.

Senator WARNER. Thank you.

General FORNELL. Mr. Chairman, I have a prepared statement I would like permission to insert in the record.

Senator WARNER. Without objection.

[The prepared statement of Gen. Gordon E. Fornell follows:]

PREPARED STATEMENT OF BRIG. GEN. GORDON E. FORNELL, SPECIAL ASSISTANT FOR ICBM MODERNIZATION, DEPUTY CHIEF OF STAFF, RESEARCH, DEVELOPMENT AND ACQUISITION, HEADQUARTERS, USAF

Mr. Chairman and members of the committee, it is my pleasure to be here today to report on the Air Force ICBM Modernization Program. In this past year we have made excellent progress in all aspects of the program.

Our ICBM Modernization Program, as recommended by the Scowcroft Commission Report, endorsed by the President, and approved by Congress, consists of three mutually reinforcing elements: deployment of 100 Peacekeeper missiles in Minuteman silos, development of a single-warhead small ICBM, and research and development initiatives in follow-on basing technology. I would first like to review the progress we have made over the last year in the Peacekeeper program and our goals for the coming year.

PEACEKEEPER PROGRAM

The present U.S. ICBM force consists of Titan IIs, Minuteman IIs, and Minuteman IIIs. The most modern of these was designed with 1960 technology. While the United States has not deployed a new ICBM since the early 1970s, the Soviet Union has been engaged in a massive modernization effort. The current Soviet ICBM force of 1,398 missiles, of which over 800 are SS–17, SS–18, and SS–19 ICBMS, represents a dangerous countermilitary asymmetry which must be corrected in the near term. The Scowcroft Commission identified the Peacekeeper as the only near-term system which can redress this asymmetry, and strengthen the U.S. position to negotiate an effective arms control agreement.

FLIGHT TEST PROGRAM

1984 was another excellent year in the Peacekeeper flight test program. We successfully conducted flight tests 4 through 6. The fourth test launch validated that the Stage III extendible nozzle exit cone anomaly of the third flight had been corrected. However, a similar failure occurred on flight 7 which has caused us to reevaluate our earlier failure analysis. The fifth flight test carried the first MK–21 reentry vehicle, the baseline reentry vehicle for Peacekeeper. This flight also marked the successful completion Phase I testing—testing to evaluate missile functional performance. Phase II testing, flight tests 6 through 13, will begin to shift toward evaluation of operational performance by testing missile/reentry vehicle capability and silo integration. Our first test in Phase II—flight test 6 in October—successfully deployed six MK–21 reentry vehicles. The first of 4 additional flight tests scheduled for the Peacekeeper in 1985 has already taken place, and the system continues to perform remarkably well through flight test 7. Flight test 7 was a high

reentry angle test which subjected the MK-21 reentry vehicle nose tip to high dynamic pressure environment. Flight test 9 will be the first silo launch of a Peacekeeper missile from Vandenberg AFB, California.

Peacekeeper accuracy for the first seven flights has been outstanding, providing high confidence that the operational goal will be met at initial operating capability instead of the three to five years later as originally planned.

COMMAND, CONTROL, AND COMMUNICATIONS

Progress in command, control, and communications during 1984 has been primarily in system design. Preliminary design reviews have been accomplished for all major sub-elements of the supporting systems. In-plant component testing has been completed for the Launch Control System, and integrated testing begins in 1985.

CONSTRUCTION

The design requirements for Peacekeeper operational facilities were completed in 1984. Modification of three launch facilities at Vandenberg AFB began in January 1984 and will continue through 1985. Installation and checkout of the first facility began in October of 1984. These facilities will be used for the first silo launch of a Peacekeeper missile in late 1985. Construction of the Assembly, Surveillance and Inspection facility at F.E. Warren AFB began in July 1984 and will continue in 1985. This building will be used to store, assemble, and checkout the reentry vehicles. Other projects include defense access roads, multi-purpose shops, launch facility trainer, and missile stage processing facilities.

Construction work at Hill AFB is primarily maintenance and logistics oriented, including alterations on the Stage I-IV maintenance facility. During 1985, we plan to continue to work on the equipment/spares storage area.

ECONOMIC AND ENVIRONMENTAL ACTIVITIES

The Final Environmental Impact Statement was submitted in January 1984 to the Environmental Protection Agency in compliance with the National Environment Policy Act.

The Air Force has developed an open, cooperative process with the states of Wyoming and Nebraska. An agreement was reached between the Governors of Wyoming and Nebraska and the Secretary of Defense that reaffirmed and documented the understanding reached by the President, the Secretary of Defense, and both Governors regarding measures to be taken to ensure that the deployment of the Peacekeeper will maintain the quality of life and not increase the environmental burden on the States.

In May 1984 a Fiscal Impact Analysis was completed providing information on the revenues and expenditures to counties and other local jurisdictions. This report provides estimates of worker immigration associated with the Peacekeeper project and assesses the increased fiscal demands these workers and their dependents will place on the local community.

FISCAL YEAR 1985 PEACEKEEPER PROCUREMENT

As you know, Congress last year placed a 6-month moratorium on the production of 21 Peacekeeper missiles in fiscal year 1985 by fencing the release of $1.5 billion of the requested $2.5 billion in the production funds. The $1 billion released last year was used for basing of the 21 missiles funded in FY 1984, maintenance of the contractor base, and for acquisition of initial spare parts and long lead items.

Release of the $1.5 billion will allow the Air Force to purchase the additional 21 missiles and to proceed smoothly with the Peacekeeper deployment program. Release of these funds now will insure that the Air Force can meet the Full Operational Capability and minimize cost increases.

FISCAL YEAR 1986 PEACEKEEPER RESEARCH AND DEVELOPMENT

For fiscal year 1986 the Air Force is requesting authorization of $784.1 million for Peacekeeper research and development activities. These funds will be used to complete the development of basing hardware and software qualification testing, and airborne launch control system testing. Research and development tasks also include software development, and five flight tests from operationally configured silos.

FISCAL YEAR 1986 PEACEKEEPER PROCUREMENT

In order to continue to keep the Peacekeeper program on schedule, the Air Force is requesting authorization to procure 48 missiles in fiscal year 1986. In terms of production line efficiency, a total of 40 missiles for fiscal year 1985 procurement was requested in order to progress toward an optimum production rate of 48 in fiscal year 1986. Congressional postponement of production funds in fiscal year 1983, reduced buys in fiscal year 1984 and fiscal year 1985, and the $1.5 billion "fence" on production funding pending congressional release in late March 1985 have caused fiscal inefficiencies. Any further delays would exacerbate the problem.

The total procurement cost for these 48 missiles is $1,937.2 million in "fly-away costs" (propulsion, guidance and control, and reentry systems), $505.3 million for basing costs, and $594.8 million for support costs. In addition, $143 million is necessary to purchase initial spare parts for the system.

PEACEKEEPER AND ARMS CONTROL

Peacekeeper deployment in Minuteman silos does not violate a· arms control provisions. Accordingly, Peacekeeper is fully consistent with exis .g arms control agreements and does not violate the President's pledge to not "undercut" these agreements.

In addition, the prompt deployment of Peacekeeper is important to the primary U.S. arms control objective: permitting the United States to move toward more stable strategic deployments based on small, single warhead ICBMs and giving the Soviets a strong incentive to do the same. As the Scowcroft Commission has pointed out, Soviet willingness to enter agreements that enhance stability are heavily influenced by ongoing programs. The Peacekeeper provides the only near-term U.S. ICBM program that could lead to deployment in the decade and thus enhances our efforts to reach a satisfactory arms control agreement with the Soviet Union.

SMALL ICBM

The Air Force continues to recognize that the Small ICBM, as expressed in the Glenn amendment to the fiscal year 1984 DOD Authorization Act, is a matter of the highest national priority. Consequently, we have applied our top resources and management skills to it. In the year and a half since the Scowcroft recommendation, the Air Force has made outstanding progress.

During 1984 we established the Small ICBM program office, now headed by Brig. Gen. Englund, the Small ICBM Steering Group chaired by Lt. Gen. Russ, and implemented Gen. Schriever's recommendation for management of the acquisition program. The concept definition phase is now nearing completion and we are entering the pre-Full Scale Development (FSD) phase.

During 1984 two findings emerged from the concept definition phase. First, we are now confident that we can build a 30,000 lb missile that will meet the performance characteristics prescribed by the Scowcroft Commission and the Strategic Air Command. The designs we have are based on Peacekeeper technology, with application of advanced technology where appropriate. Our propulsion development strategy is designed to minimize risk. We plan to maintain maximum contractor participation and completion, to reduce risks through early advance technology validation. Our selection of the modified Advanced Inertial Reference Sphere (AIRS), a lighter version of that developed for Peacekeeper ensures that the Small ICBM will meet accuracy requirements. We will pursue, simultaneously, advanced Inertial Navigation Systems that could provide lower cost, and more responsive guidance systems for the Small ICBM.

Second, preliminary scale-model testing in shock tube tests, simulating the nuclear environment indicates that a hard mobile launcher of 30 psi or greater is feasible. This means that we will be able to deploy mobile ICBM systems on DOD property using far less land than estimated for any previous mobile concept. This will minimize public interface and environmental impacts while reducing manpower requirements and enhancing security and safety. We will enter pre-FSD with two hard mobile launcher concepts which we will analyze, test, and evaluate very carefully to select the best concept for Full Scale Development. We have also developed preliminary concepts of operations for the hard mobile launcher. These concepts will provide effective system survivability, minimize conflict with missions of other forces deployed on the base, and address projected operating costs.

Our goals as we move into pre-FSD are to maintain a high degree of competitiveness among contractors while focusing on the best deployment and missile concepts to carry into Full Scale Development.

Along with the great strides made in the Small ICBM area, the Air Force is proud of its achievements in the area of follow-on technology.

FOLLOW-ON BASING TECHNOLOGY

Superhard silo technology

Results from our silo hardness test program are very encouraging. We have a well-defined plan for developing silos of maximum obtainable hardness. Tests on scale model structural components conducted at Luke AFB indicate that silos can now be designed to survive at levels 25 times greater than current U.S. silo hardness.

During 1984 superhard scale tests, and various crater calibration tests and modelling predictions were conducted to validate superhard silo concepts. In 1985 larger scale tests, as well as continued analysis and testing of cratering phenomenology, will be conducted.

For fiscal year 1986 the Air Force is requesting $152.2 million for continued superhard silo research.

Deep basing technology

An analysis of deep underground basing for ICBMs and other vital strategic assets is important because of its potential survivability characteristics. Deep-based ICBMs could act as a complement to other ICBM basing strategies that allow for more prompt response.

SUMMARY

We are pleased with the significant progress we have made since receiving our Congressional mandate to proceed with ICBM modernization.

Deployment of 100 Peacekeeper missiles in Minuteman silos is needed to redress the current counterforce asymmetries and has encouraged the Soviet Union to return to the bargaining table.

Research and development efforts for the small single-warhead ICBM are well underway, and the Air Force expects progress to continue in 1985. The follow-on technology effort has produced the encouraging results—particularly the superhard silo joint testing program with DNA.

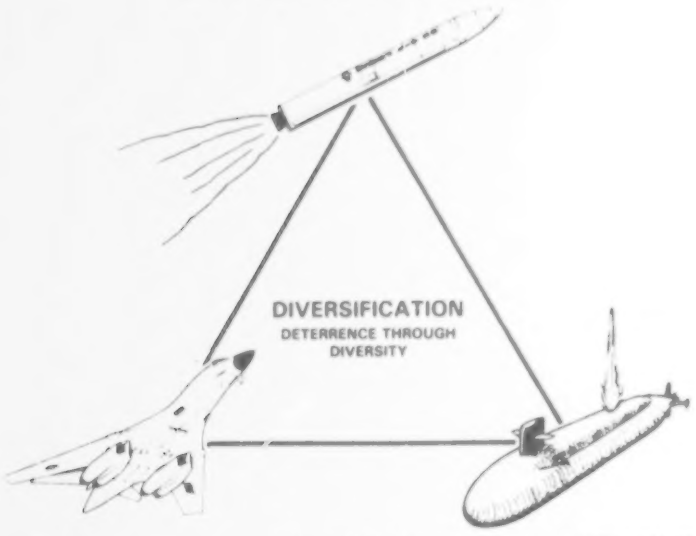
With continued congressional support, the Air Force is confident that these successes will continue and provide the United States with a deterrent nuclear force well into the next century.

General FORNELL. As Dr. Cooper indicated, Mr. Chairman, I would like to give you a progress report on our ICBM modernization and show you in the year's time——

Senator WARNER. This statement indicates secret.

General FORNELL. No. Just the cover. I am going to remain unclassified.

U.S. STRATEGIC TRIAD



General FORNELL. We have carefully described over the last few days of the hearing our reliance on the strategic triad and that has been reinforced and enhanced especially following the Scowcroft Commission report.

Modernization programs are underway in each of the legs of the triad. Today I am going to concentrate on the ICBM modernization. Of course, we believe the strength of the triad is in its flexibility and diversification of forces and what it does in the eyes of the Soviet planner in particular.

The Scowcroft Commission's key phrase as far as the Air Force implementation of those recommendations was to identify the problem in bite-size pieces, so that we could put together a program, implement and accomplish the goal set out in that report.

U.S. ICBM FORCE WEAKNESS

AGING FORCE
- TITAN II – 1962
- MM II – 1965
- MM III – 1970

DECREASING COUNTERMILITARY CAPABILITY
- SOVIET SUPERHARDENING

INCREASING VULNERABILITY
- IMPROVING SOVIET ACCURACY

The main elements of those recommendations, though, were to recognize we had an aging, less capable missile force to run our targeting criteria against a very increased hardness level of a Soviet target base. Those older missiles with mid-sixties technologies, deployment of our latest version in the early seventies, do not have a high capability against the Soviet target base.

The flip side of that, of course, is the continual Soviet development, test, and deployment of modifications, improvements, and you have heard the litany today, I believe, of the missile developments that have occurred in the Soviet Union that have a quite high capability against our strategic target bases.

STRATEGIC MODERNIZATION PROGRAM

MAINTAIN AND IMPROVE BALANCED MIX OF FORCES – TRIAD

FIVE POINT STRATEGIC MODERNIZATION PLAN – OCT 1981
- COMMAND, CONTROL, AND COMMUNICATIONS
- STRATEGIC BOMBERS
- ICBMs
- SEA BASED FORCES
- STRATEGIC DEFENSE

STRATEGIC MODERNIZATION IS COMPATIBLE WITH U.S. ARMS CONTROL GOALS
- REDUCTIONS
- EQUALITY
- STABILITY
- VERIFIABILITY

Therefore, sir, we began in earnest a defined Strategic Modernization Program. The reason I use this chart is that it is a five-point program.

We indicated there has been an improvement in the communications, command-and-control element. We don't talk to that as often, perhaps, as we should, but indeed the other elements of the triad are being modernized and, of course, now there is emphasis in the strategic defense area as well.

I think from an overall standpoint, the total integration of those efforts in modernization with our arms control and arms reduction efforts and contribute greatly toward greater stability between us and the Soviet Union.

Dr. COOPER. Before we leave that slide, Mr. Chairman, I know you have had very lengthy discussion today on the vulnerability of the ICBM force. I would just like to point out that if you put yourself in the place of a Soviet planner, this is what he has to neutralize when he looks across the line.

While we would very much like to make each leg of that triad invulnerable from the point of view of a Soviet planner, when he asks himself the question, is today the day, this is what he is confronted with.

I personally prefer, when we talk about survivability and vulnerability, to bring it up on a slightly higher plane and look at our whole strategic deterrent system which is not composed of just one element, but all three elements.

General FORNELL. The Air Force, following the congressional review of the Scowcroft Commission report and the passage of the 1983–84 bill, packaged a program to implement those instructions.

To address the military effectiveness question was the immediate deployment of 100 MX Peacekeeper missiles in existing Minuteman silos at Francis E. Warren Air Force Base at Cheyenne, WY.

Second, to begin the engineering design of the Small Hard Mobile Launcher Program looking at long-term survivability and stability.

And also to continue the basing technology program, which we had begun early on as part of our overall look at the system. How-

ever, the emphasis should now be to continue that program in an energetic way to answer the technical uncertainties we had and to define the hardness limits so that we could come back to the Congress in a consultative way and tell you how the prospect is coming along.

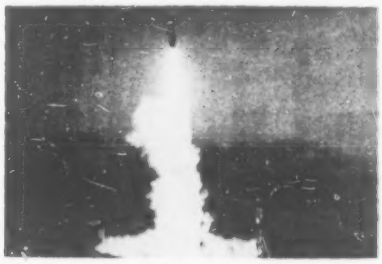
We have described many times the integration of those efforts in the program in our overall attempt at strategic nuclear arms reduction.

PEACEKEEPER

($ IN MILLIONS)

	FY 84 & PRIOR	FY 85	FY 86	FY 87	TO COMPLETE	TOTAL
RDT&E	3875.2	1099.7	784.1	360.8	61.4	6781.0
WPN SYS PROC	2075.7	2352.0*	3037.3	2774.7	3941.5	14,181.2
QUANTITY BUY	21	21*	48	48	85	223
DELIVERIES	0	0	6	22	195	223

FY 86
RDT&E REQUEST
$ 784.1



FY 86
WPN SYS
PROC REQUEST
$ 3037.3

- FLYAWAY 1945.2
- SUPPORT 543.7
- OTHER WEAPON SYS 548.4

SCHEDULE

- IOC DEC 86
- FOC DEC 89

* $1.5 BILLION/21 MISSILE PROCUREMENT PENDING FURTHER CONGRESSIONAL ACTION

For our fiscal year 1986 request, sir, and a brief summary of fiscal year 1985, these are the dollars we have requested in our research, development, test, and evaluation line.

Our procurement dollars are at $3 billion for 48 missiles. Of course, we had a key element in the fiscal year 1985 bill that has now been presented to both Houses of Congress as a resolution which requires approval in four separate votes of the House and Senate to release the fence around the 21 missiles and $1.5 billion associated with fiscal year 1985.

I think it is key here in fiscal year 1986. You can see the decrease now. We are on the down slope as far as our research and development effort. We are mainly devoted now to the continuation of our test assets, our test program, and as the production becomes more efficient in the learning curve effect, the procurement dollars in fact remain somewhat constant as we are able to develop, build and produce those missiles that we have in our request.

The key to us in 1986 is the attainment of our initial operating capability of 10 MX missiles on alert by December 1986.

I can report to the committee again this year with high confidence that we will achieve the IOC. The IOC was a very important

goal we set out many, many years ago and now I feel very, very comfortable that we will make it.

FOC, as we have described today, full operational capability, of the 100 missiles deployed, based on the delivery schedules and the request, of course, that we have on a yearly basis, would be in December 1989.

General Russ. Mr. Chairman, if I might add a note there. During the last panel Senator Glenn had some questions about the timetable for the small missile and the Peacekeeper. He used two terms, a 2- to 4-year break between those.

I think there is a little confusion on IOC and full operational capability. At the end of 1989 we will have 1,000 warheads long before the first small missile, several years before the first small missile comes on alert.

So, a fair comparison would be when do you get your first Peacekeeper and when do you get your first small missile? That is about 6 years.

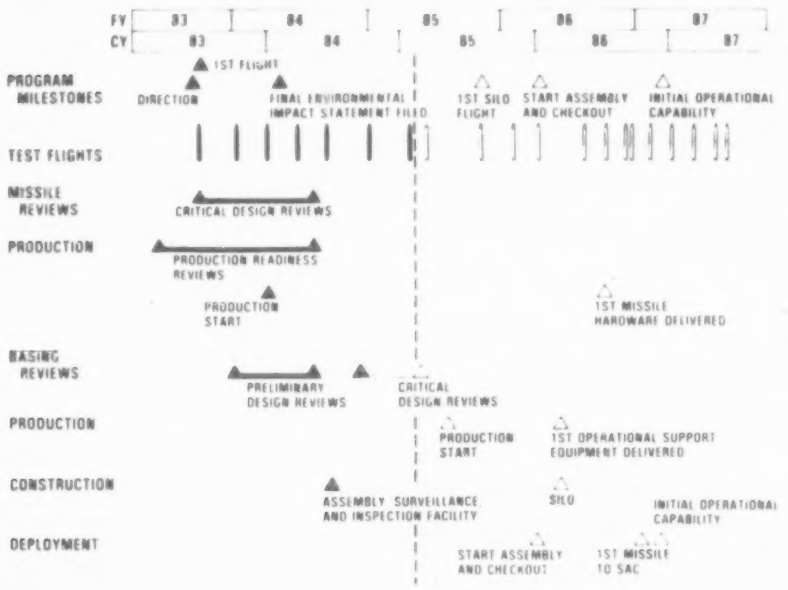
So, it is not a 2-year timeframe. People sometimes confuse them and they run them together. They are really not that closely spaced.

Dr. Cooper. General Russ made a telling point. When you deploy a Peacekeeper, you deploy 10 warheads. When you deploy a small missile, you deploy one warhead.

Senator Wilson. It is a longer period between full operational capability and initial operational capability.

Dr. Cooper. Yes for a comparable number of warheads because we are only deploying one warhead per missile when we deploy the small missile. So, it is even longer than 6 years, when you look at the time gap.

PEACEKEEPER DEVELOPMENT SCHEDULE



General FORNELL. Mr. Chairman, I selected this chart not merely to show you and for consistency from year to year, time does pass even on the MX program. We are in the early part of 1985, and many things are behind us.

We have accomplished those things that are necessary in a program to keep momentum going. Our critical design reviews, production readiness reviews, military construction in support of our IOC. The facilities are up and running and doing the things necessary for a very active production program.

PEACEKEEPER PROGRAM

CONTRACT OVERVIEW

MISSILE PROGRAMS

STAGE I	THIOKOL	ARMING AND FUZING ASSEMBLY	– GE/AVCO
STAGE II	AEROJET	MISSILE GUIDANCE AND CONTROL SET	– AUTONETICS
STAGE III	HERCULES	INERTIAL MEASUREMENT UNIT	– NORTHROP (ED)
STAGE IV	ROCKETDYNE	THIRD GENERATION GYRO	– NORTHROP (PPD)/ HONEYWELL INC.
REENTRY SYSTEM	AVCO	SPECIFIC FORCE INTEGRATING RECEIVER	– HONEYWELL INC.
REENTRY VEHICLE	AVCO GE		

BASING PROGRAMS

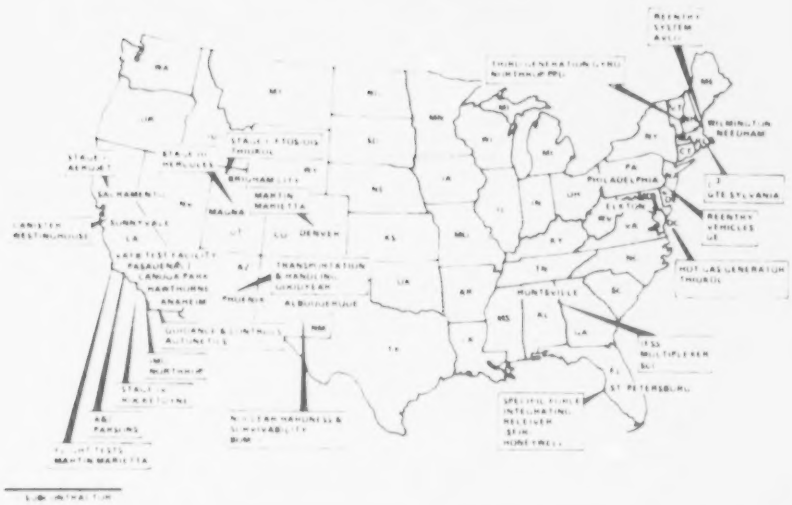
LAUNCH CONTROL SYSTEM	– GTE
TRANSPORTATION AND HANDLING EQUIPMENT	– MARTIN MARIETTA
CANISTER SYSTEM	– WESTINGHOUSE
OPERATIONAL SUPPORT EQUIPMENT	– BOEING

SYSTEMS ENGINEERING TECHNICAL ASSISTANCE (SETA) – TRW

To give you some sense of the relationship we have with our contractors, I just wanted to show you that many, many contractors are involved in MX.

Of significance here is that the Air Force serves as the prime contractor in the missile system, somewhat different than an airplane or submarine in the procurement world. We have an associate contractor relationship among many. I would like to report that their performance has been absolutely exceptional in meeting the cost, schedule and performance requirements of each of their specific contracts.

THE CONTRACTORS



Here is what that looks like in a spread over our entire country, major contributions made throughout our country, all integrated out here at the Ballistic Missile Office in California, test activities conducted out in California and, of course, deployment schedule and activity in the Cheyenne area centered at Francis E. Warren Air Force Base.

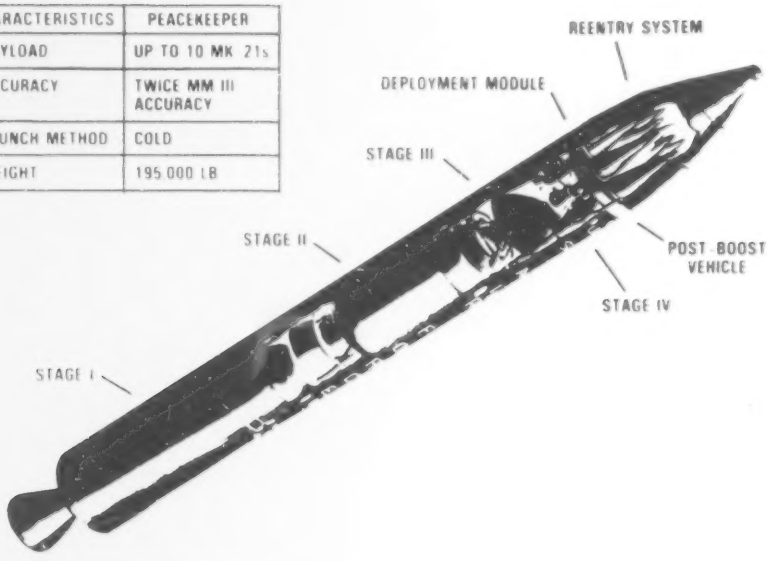
Dr. COOPER. Mr. Chairman, I would like to make a point about the production line.

We have heard proposals asking why don't we put it on the shelf for 6 months? It is not possible to do that with a hot production line, as you well know. The turbulence that would be introduced into the vendor and subcontractor base would be extreme.

It would be tantamount to shutting down the line. Certainly you could re-start it at some point in time, but that would be at the expense of a significant addition in schedule to the program and also significant cost. It is not like a light switch that you can turn on and off.

PEACEKEEPER MISSILE

CHARACTERISTICS	PEACEKEEPER
PAYLOAD	UP TO 10 MK 21s
ACCURACY	TWICE MM III ACCURACY
LAUNCH METHOD	COLD
WEIGHT	195 000 LB



Mr. Chairman, of course the MX Peacekeeper is a large missile, 195,000 pounds, 70 feet long, 92 inches in diameter. It operates with 10 MK-21 warheads. It is achieving remarkable accuracy, as we have indicated, and I can show you that at the very end in closed session or to the members personally or in a memo for the record.

We utilize a cold launch method which merely says we launch it from inside a canister similar to a submarine launch on a gas-generated air bubble and it pops to the surface out of the canister and then stage one ignites.

[Additional information follows:]

The accuracy of the Peacekeeper missile during the first seven flights has been excellent. The reentry vehicle impacts for the first seven missions are shown below. The test range accuracy for all missions to date is under [deleted]. Although test results are extremely encouraging, the small sample size and operational trajectory differences argue against drawing specific conclusions about operational accuracy.

PEACEKEEPER FLIGHT-TEST RESULTS

[Deleted.]

Senator WARNER. There is a view out there, and I will not attribute this to any particular person, as follows:

A suggestion that we seek an understanding to postpone the vote to a later date; in the meantime, plenty of available production to feed on 21 missiles approved in fiscal year 1984 and a billion dollars is available in fiscal year 1985 to maintain a hot production and order long lead materials so that we may move ahead expeditiously in production and deployment, if necessary.

What would you interpret that to mean?

General FORNELL. I would interpret that to mean it amounts to cancellation of the program. We have been delayed 6 months with

the reconsideration for 21 additional missiles. We are making do with the long lead funding you gave us last October.

We worked very hard with respective committees and Members as to what was a reasonable time date on which to continue. We are bumping up against that log at the moment. The votes on 21 additional missiles is the bridge.

We are coming up on the absolute drop dead time with respect to the requirement for the money and requirement for the continuation of deployed missiles, production line, and the activity that we have underway.

The warm production line idea I think is a poor idea, mainly from the sense that we are gaining absolutely nothing from that activity. As you indicate, people are standing still being held together merely with the subsistence of money to hold teams together in the event of future production and release of production contracts and money.

That is extremely difficult to do in the business world. Our community does not just live together on that kind of thread of hope. They actually do need funds and commitment on the part of the Air Force.

The criticism that we have unobligated moneys available to tide us over simply is not true. Of the $1 billion in 1985 we have obligated in a very energetic way to keep the basing and support production activities and the long lead production items going. We are doing the basic things required to be in a position in the March time frame following your vote to continue production with the additional 21 missiles.

At the end of March for the procurement of the $1 billion that is noncontentious—99.2 percent of that money will be obligated.

By the end of March we are scheduled to have 99.2 percent of that money obligated. This was worked out in advance with the committees, in the hope that we would have a turnaround of this vote in a positive way and then be able to continue without a tremendous interruption in our production activity.

Senator WARNER. So, in response, I repeat it again, in the meantime, funding is available for production to feed on the 21 missiles approved in fiscal year 1984. Your statement in reply to that?

General FORNELL. It is not.

Senator WARNER. It has been obligated?

General FORNELL. It will be obligated. Our estimate is 99.2 at the end of March.

Senator WARNER. The second part, a billion dollars is available in fiscal year 1985 to maintain a hot production line and order long lead material so that we may move ahead expeditiously in production and deploy if necessary?

General FORNELL. Both of those numbers are over 90 percent, sir. Of the moneys available from our fiscal year 1984 procurement of 21 missiles, well over 90 percent of that money will be obligated by the end of March.

We have managed that money, we have done those things that we worked out in particular with the committees, members of the staff, for this date and that is one of the reasons that this date, I believe was chosen for the selection of the voting.

[Additional information follows:]

The $1.0 billion appropriation which was not fenced has been allocated as follows and agreed to by the leadership of the Senate and House.

	Millions
Basing for fiscal year 1984 missiles	$792
Spares	148
Long lead for fiscal year 1985 missiles	60

By the end of March 1985, these funds will be virtually all obligated. The $60 million for long lead and maintenance of the contractor base which was to carry the program through April 1, 1985 will be gone and subcontractors will begin to shutdown their Peacekeeper production capability. In some cases this production capability has taken years to develop. To requalify these vendors and subcontractors after a shut down would take 8-12 months and result in a $1.3 billion program cost growth.

IMPACTS OF NO SECOND INCREMENT OF $1.5 BILLION

- NO MISSILES PRODUCED AFTER FIRST 21 FOR FY 84
- FULL OPERATIONAL CAPABILITY IN 1989 BECOMES UNACHIEVABLE
- OPERATIONAL FLIGHT TESTING IS DEFERRED
- AGING AND SURVEILLANCE TESTING IS DEFERRED
- LOWER TIER CONTRACTOR TEAM IS LOST IMMEDIATELY
- PRODUCTION CAPABILITY FOR FY 86 IS ERODED
- INTERRUPTION CAUSES INEFFICIENCIES THAT DRIVE UP TOTAL PROGRAM COSTS

General FORNELL. I have tried to summarize the specific impact of what the negative vote would be. The impact I have tried to show you is here. There would be no missiles after the first 21. In particular, the deployment of the full operational capability in 1989 certainly becomes unachievable.

A very important ingredient that our planners and our strategic planners use is the operational test of the missile confidence. That activity would be deferred.

Our Logistics Command, in its aging and surveillance program where we examine what time does to a missile, would be forced to delay the start of that valuable program. Immediately, our lower tier contractor team would be lost and that really is a very difficult switch to turn on and off.

Our production capability in the assumption we used for fiscal year 1986 is certainly in question because it requires a significant ramp up to whatever number is necessary from that point on. Of course, we try to put together a program that is efficient to minimize the overall life cycle cost.

Of course, that type of stop-start mode certainly introduces inefficiencies that drive our overall program cost.

Dr. COOPER. If General Fornell has not been quite clear, I would like to say we are not enamored with that particular proposal.

Senator WILSON. He has been clear.

PEACEKEEPER IN EXISTING MINUTEMAN SILOS

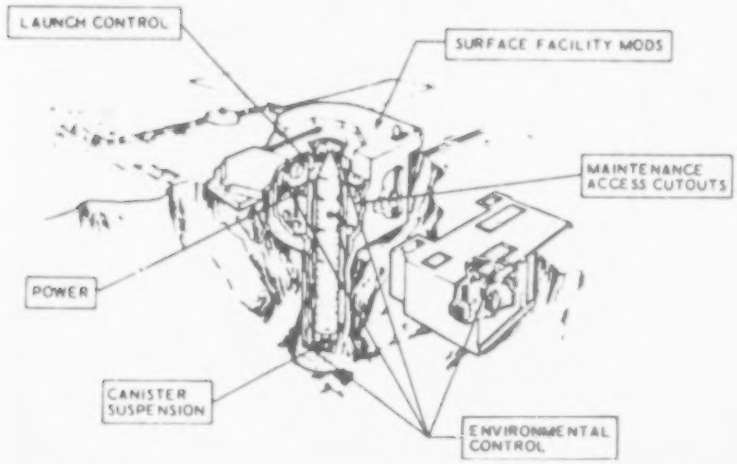
- MODIFY LAUNCH FACILITIES AND LAUNCH CONTROL FACILITIES TO ACCOMMODATE PEACEKEEPER MISSILE
- PROVIDE MEANS TO ASSEMBLE PEACEKEEPER MISSILE ON SITE
- PROVIDE SUPPORT FACILITIES AT F E WARREN AFB
- PROVIDE FACILITIES FOR
  - TRAINING
  - LOGISTICS SUPPORT
- ACCOMPLISH THESE TASKS WHILE
  - MEETING A 1986 IOC
  - TAKING MAXIMUM ADVANTAGE OF EXISTING HARDWARE
  - MAINTAINING EXISTING HARDNESS

General FORNELL. What we have planned in our activities for fiscal year 1986 is to deploy the MX Peacekeeper in existing Minuteman silos. That includes this kind of work activity that you see on this chart. It does modify the launch facilities and launch control facilities to accommodate the missile.

It provides us with a method of building the missile actually at the individual silo site. Our support facilities are underway at Francis E. Warren. What we are doing carefully here, is to field a supported weapons system. That is, we have the data, technical manuals, and the training tasks accomplished on schedule. This effort has come along very well.

We need to do these tasks in order to meet our IOC, but we are taking the system that we have there, deploying it in the near term because of our definite need for the military capability that MX provides to our overall strategic force.

PEACEKEEPER IN EXISTING MINUTEMAN SILOS



This is what that activity looks like, we have a launch facility in a silo. We are doing the modification to the launch facility. The surface facility modification, access to the missile itself, the cooling and environmental and electrical systems are changed for the specific requirements of the MX missile.

The canister, of course, is a unique feature of MX and fits perfectly into the existing Minuteman silo facility. Power requirements, both from a day-to-day standpoint and that necessary for a survivable system such as batteries, are unique to MX and are being upgraded.

PEACEKEEPER LAUNCH CONTROL SYSTEM

- MODIFY FOR UNIQUE PEACEKEEPER REQUIREMENTS
- COMMON – WITH MINUTEMAN – ALCC UPGRADE
  - – REPLACE AGING/UNSUPPORTABLE HARDWARE
  - – STATUS UPLINK, RETARGETING CAPABILITY FOR PEACEKEEPER
- IMPROVE RESILIENCE TO SLBM DECAPITATING ATTACK ON LCCs
  - – INTER-TIE PEACEKEEPER SQUADRONS
    - 2 LCCs OF 10 CAN CONTROL 100 PEACEKEEPERS
  - – MINIMIZE CREW RESPONSE TIMELINES CONSISTENT WITH JCS GUIDELINES

In command and control, we are using the basic system that we had for our Minuteman system, but we are adapting where we can and using those things that are already in place. Our approach is

to satisfy, in the lowest cost way, our unique Peacekeeper requirements.

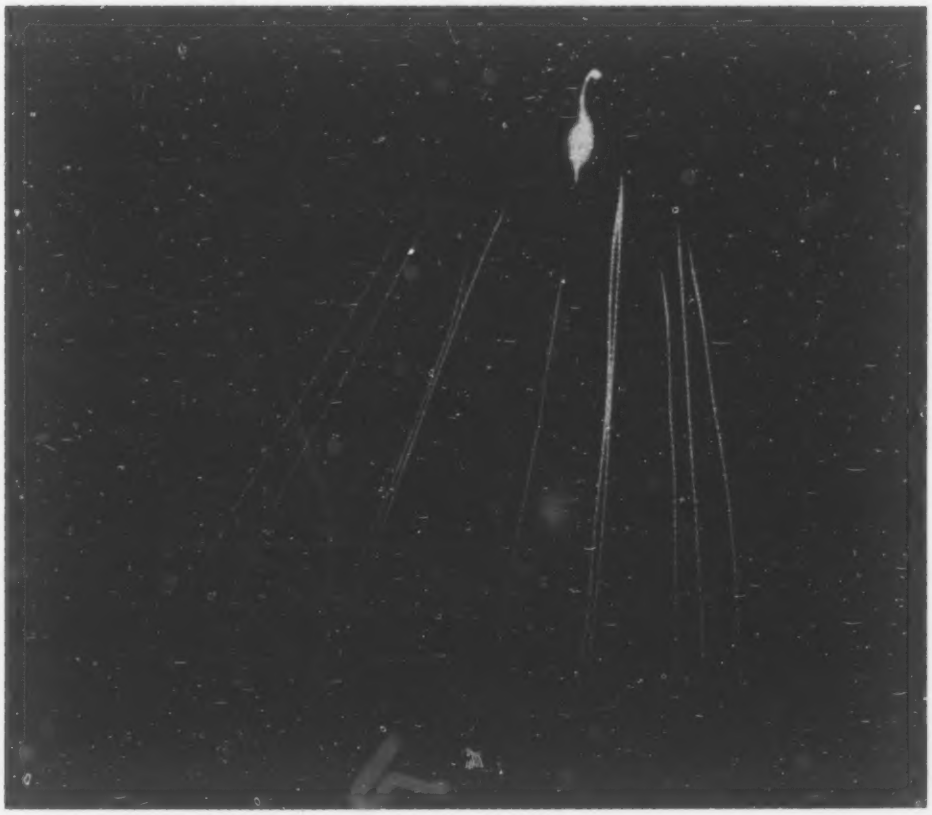
We also, of course, have a linkage with our airborne launch control centers, those aircraft that are capable of launching our missiles from an airborne platform. The airborne launch systems are being upgraded and will be compatible with both the Peacekeeper and the Minuteman force.

Of course, what that does is provide resilience against a particular SLBM threat of attack on our underground launch control centers.

As I indicated, sir, we have had seven highly successful flight tests of our overall program of 20 RDT&E scheduled missions. The last one was on the 1st of February and we have exercised the system to its full capability.

That means that we have carried up to the 10 reentry vehicles. We have gone long range, we have done lofted trajectories, high heating, and high velocity reentries.

In the bottom line sense the MX Peacekeeper missile works. The performance has gone very well. The reliability has been looked at and is in a very, very favorable position. But the real crux of the matter, as far as military effectiveness, is that of the accuracy achieved in the flight test program. That is very good and, as I have indicated to you and members of the staff before, I'll show you that on a continuing basis and have a slide for a closed session or for your individual review later on.



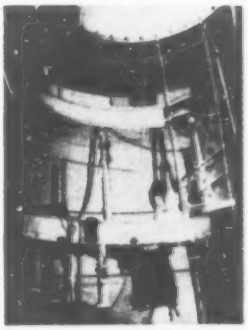
This is the business end of one of the flights, which carried 10 reentry vehicles out to the Kwajalein Island scoring area where we participated with the Army in the scoring of the individual reentry vehicles as they impacted on the ocean surface.

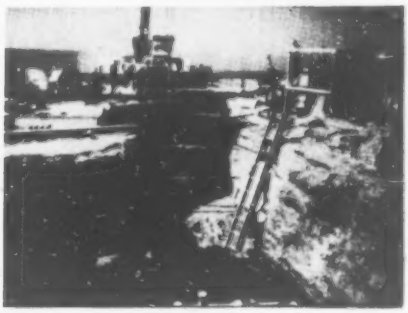
Also, as you may have read, we have some broad ocean area shots scheduled to do the full range capability. Of course, with the Australian situation we are modifying our plans slightly to accommodate that little wrinkle in the operation.

Other activities that are accomplished during our flight test phase are a look at stage one recovered out in the middle of the ocean. This is a very difficult task, but we were able to go back and evaluate the heating and the shielding and the insulation requirements in the very advanced systems and have come very, very close to predicted values which is particularly encouraging in the R&D phase.

PEACEKEEPER VANDENBERG AFB LAUNCH FACILITY MODIFICATIONS

- THREE LAUNCH FACILITIES UNDER MODIFICATION
- DEVELOPMENT AND EVALUATION TESTING STARTED DECEMBER 1984
- WEAPON SYSTEM INTEGRATION TESTING STARTS APRIL 1985
- FIRST SILO LAUNCH IN SUMMER 1985





Activities that give us high confidence in particular, as we focus on Francis E. Warren Air Force Base in Cheyenne are those flight and other like activities we do at Vandenberg Air Force Base.

We have three missile silos to be modified to look like operational silos in Wyoming. Our test program moves to launching from a missile silo on our ninth sortie. We will be launching from a Minuteman silo that has been adapted to take a configuration like those at Francis E. Warren so that our data and operation is completely and unequivocally transferred to the activity.

At Vandenberg we do the same operation as at Francis E. Warren.

Senator WARNER. Is the hardness application being incorporated in the construction?

General FORNELL. This is in the same configuration. The silos at Warren are the latest versions, the best silos that we do have.

PEACEKEEPER GROUND TEST STATUS

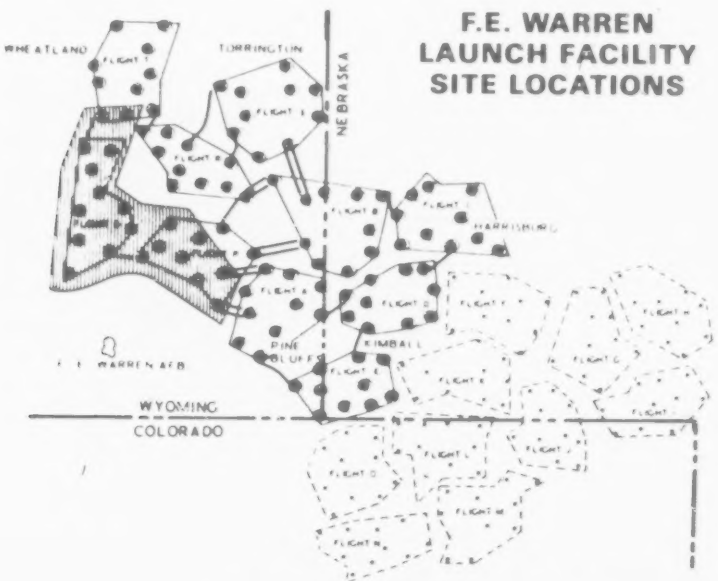
STAGE II PREQUALIFICATION SEA LEVEL FIRING ON 19 OCTOBER

STAGE I PREQUALIFICATION SEA LEVEL FIRING ON 14 NOVEMBER

STAGE II QUALIFICATION TEST ON 16 NOVEMBER

Other activities give us high confidence as well. Each integrated part of this missile is tested and retested, both in a ground environment and in a simulated altitude chamber at our Tullahoma test facility.

Each individual stage is test fired on numerous occasions to be sure we are getting performance and reliability out of that particular stage. We have a very aggressive program in this area.



You may not have seen what a Minuteman wing looks like. This is Wing Five of our Minuteman III force centered at Francis E. Warren.

We plan on deploying 100 Peacekeeper missiles, 69 sites in Wyoming, 31 sites in Nebraska. The other sites that are in Colorado and the other 100 sites at F.E. Warren will be untouched or unmodified by our operation at F.E. Warren.

Our initial deployment will be in the two flights that are nearest F.E. Warren to support our squadron entity. Communications, com-

mand control and logistics of doing this make up a very, very large task.

As a matter of interest, 2 weeks ago last Friday, we awarded the contract for assembly and checkout of this deployment, to the Boeing Co. in Seattle to individually assemble the missile at each site, check it out and turn it over to the Air Force.

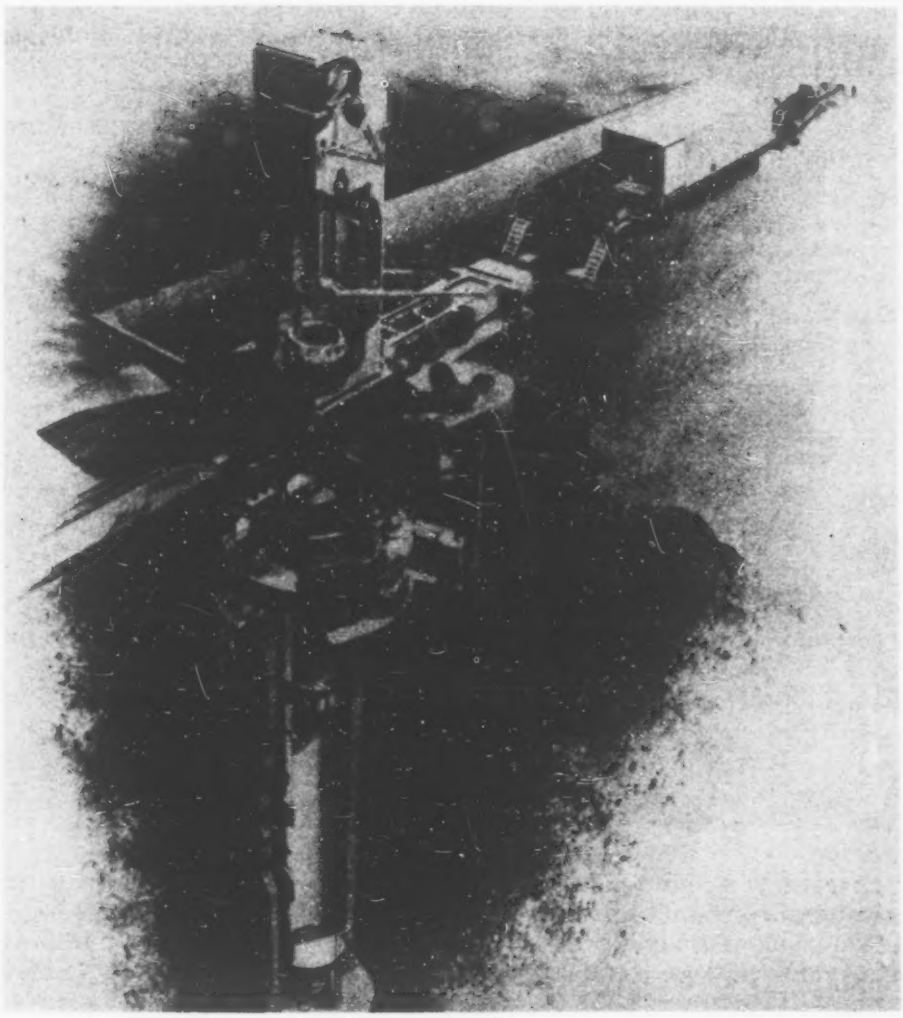
A point here is, these programs are not simple. We have a marvelous relationship with Governor Herschler in Wyoming and Governor Kerry in Nebraska, in working to mitigate the impacts of bringing this major weapon system to that deployment area.

We have worked with school boards, water boards and those things necessary to make that a very easy transition as we bring this very major project to this part of the country.

To give you some sense that other facilities are up and running, the crucial facility that was necessary to meet our initial operating capability was this assembly, surveillance and inspection building where we build up the reentry system of the missile.

That building is critical. We worked out with the Military Construction Committee a way to contract that and make it happen before our IOC date. I am very, very happy to report that that building is up with a roof on it. We needed to beat this Wyoming winter which was absolutely deadly out there as far as the construction business. Completion will support our IOC which was really a crucial item for us a short time ago.

Other facilities as far as the roads and buildings and utilities, they are on an equal base to support our operation in Wyoming.



Once assembly and checkout begins, as those farmers and ranchers who have had those missiles on their land for many years understand it, we will pull the old missile out of the hole. We will do some refurbishment to the missile silo itself.

We put the canister in first. Then we bring this erector vehicle which serves as interface to bring the individual stages out by transport truck, transition it through the vertical facility and then with a fully certified elevator in the canister, we construct the missile itself at this site.

This identical operation will be accomplished at Vandenberg during our test program beginning with our ninth missile launch. It is a very innovative and clever idea, I believe, as far as our operation in the local area.

Senator WARNER. You used "assemble" the first time and this time you used "construct."

General FORNELL. Assemble, construct. I use them rather interchangeably.

Senator WARNER. You are assembling components?

General FORNELL. We are assembling the individual stages to make it into a full operational missile.

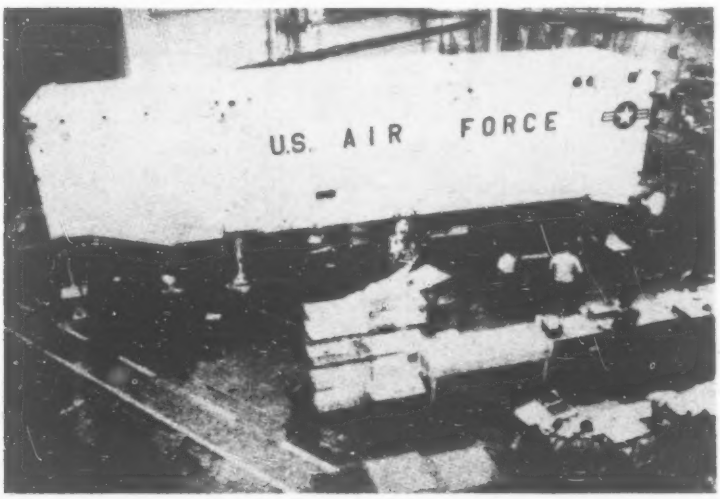
Senator WARNER. Components are fabricated?

General FORNELL. They are fabricated at each of our contractors, about 14 major contractors.

Senator WARNER. This is really component integration?

General FORNELL. That is correct.

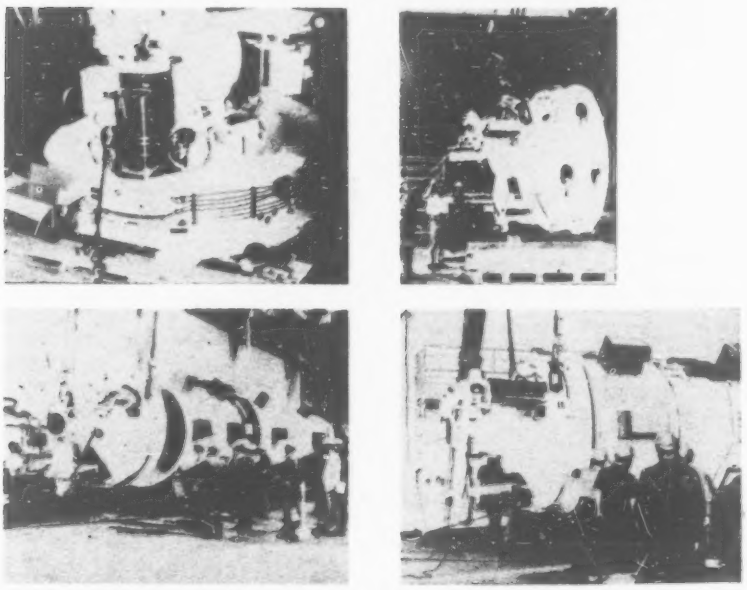
PEACEKEEPER EMPLACER



To give you some sense that the other production facilities are turning out production articles, this is the transporter erector.

You see construction of this equipment, supporting equipment, is being done and production is underway as well as the missile components themselves.

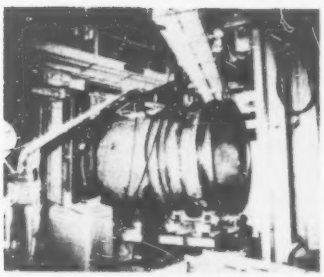
PEACEKEEPER VERTICAL SHOCK ISOLATION SYSTEM INSTALLATION

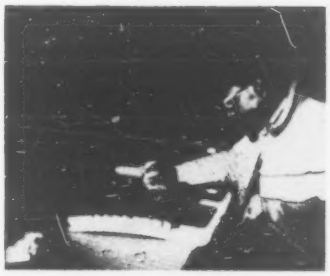


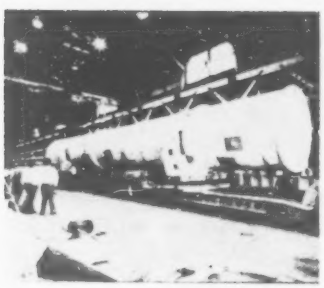
In the missile component area this is what a vertical, shock isolation system consists of. You have a very interesting capability.

We sublet some of this activity to some Indian corporations in Nebraska and down to the very small component level. Shock isolation system production is underway.

PEACEKEEPER CANISTER

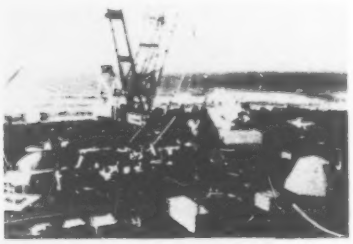


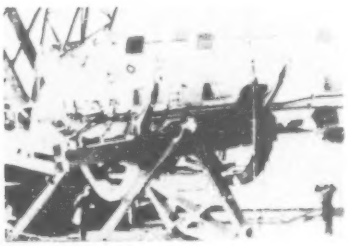


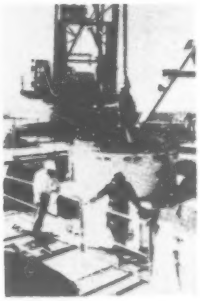


To give you some sense of progress, this is the canister facility at Westinghouse. You see the industrialization or capitalization that has been made by our associate contractor partners in turning out production articles for the first 21 missiles authorized and appropriated in fiscal year 1984.

PEACEKEEPER CANISTER INSTALLATION

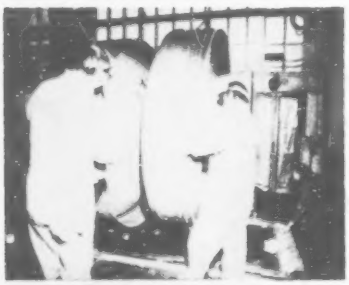


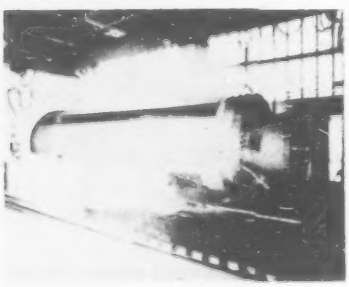


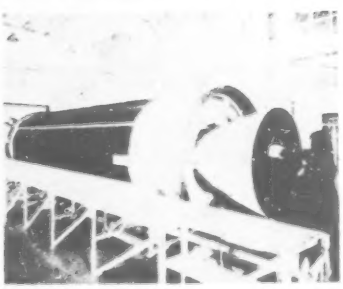


This is the canister itself. We now have actual experience in placing that canister into the silo being modified at Vandenberg Air Force Base. That will be the site of our first launch out of a silo, as I indicated, in flight test 9.

PEACEKEEPER STAGE I ASSEMBLY

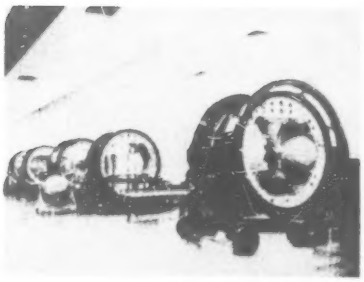


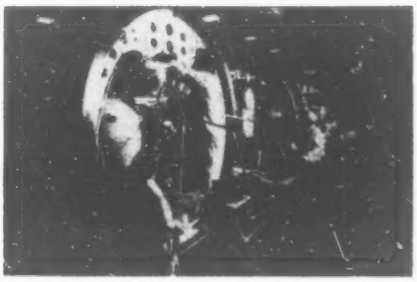




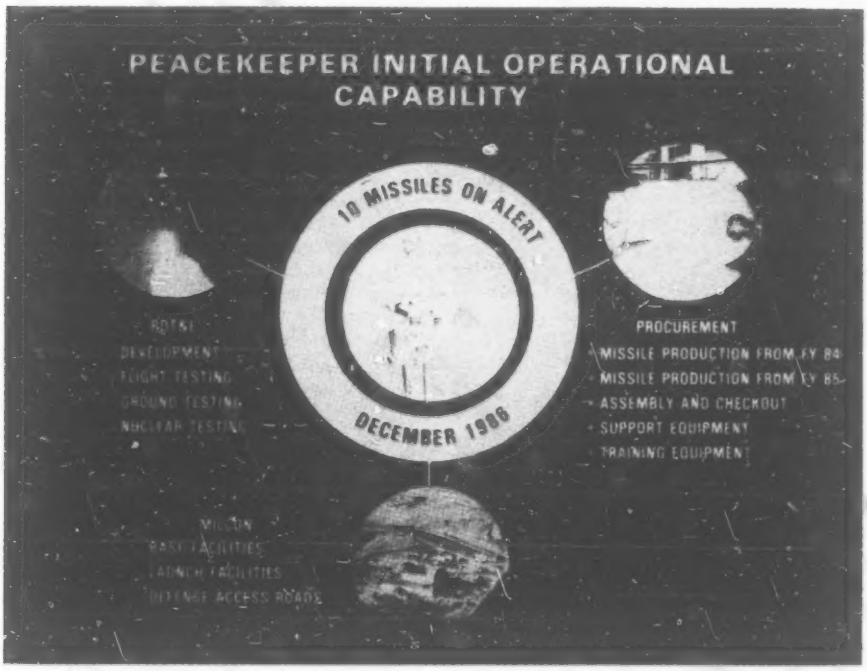
This is Stage one, which weighs 108,000 pounds. I wanted to show you that production facilitization is underway and we are producing product articles that you have approved.

PEACEKEEPER STAGE IV PRODUCTION





This is the Rocketdyne assembly line. Here we build the liquid propelled stage four of the missile also in a very clean environment. I wanted to show you that production is underway, the process is geared up and is producing those articles.



Overall, sir, for the capability of meeting our initial operating capability, I want to assure the committee we have high confidence in achieving that. We have that because of the extensive developmental flight testing, ground testing activity that we have accomplished.

A very interesting facet, of course, is that this is a nuclear system, it requires an amazing amount of critical design and criteria work accomplished and that is on schedule. Sometimes this is a very bureaucratic process that takes a great deal of time, but even that has gone very well for the Peacekeeper.

As I indicated, all aspects of procurement are up and running and turning out those articles to support the system. In addition very important from a facility standpoint, those facilities are up and in place, standing by to begin the deployment process.

Senator WILSON. I don't know how much more is left of your briefing. I have to leave shortly. I do have some questions.

Senator WARNER. I will be glad to accommodate the Senator.

Senator WILSON. The Air Force this morning, it was implied criticism, was not moving quickly enough on the small missile.

I will give you an opportunity to elaborate on the assurance given this morning.

Would you review for us the normal acquisition and review procedure prior to full-scale development required under the law by the Federal Acquisition Regulations?

Dr. COOPER. Senator, in building a major system, we have a series of what we call Air Force System Review Councils and Defense System Acquisition Review Councils.

Senator Warner, you are very familiar with those. We have not yet scheduled an AFSARC or DSARC for the small missile, although we will in the future.

We have had two DSARC's for the Peacekeeper before I came to the Pentagon. The first was in March 1976 and the second was in December 1978. In addition, major programs are of very specific interest to the Secretary of Defense. He reviews Peacekeeper and Small ICBM Programs on a monthly basis.

We try to use streamline management on the programs.

Senator WILSON. Do you anticipate there will be an AFSARC and DSARC?

Dr. COOPER. We have yet to enter what we call the formal full-scale engineering development phase for the small missile. I believe our current plan is to have an AFSARC prior to doing that. I can't give you a date.

As General Fornell says, it is probably the latter part of 1986.

I would like, if I might, to take your question head on about the pace of the small missile.

I personally think we are moving about as fast as we can on the small missile. That is probably one of your concerns.

Senator WILSON. I am not one of the complainants.

Dr. COOPER. We are not moving too fast. I don't think we are doing anything foolish, but I don't really believe we can accelerate it to any significant degree.

Right now from start to IOC we are looking at a 9-year program. If you look at a similar span for the MX, we are looking at 14 years. Of course, we are feeding off the technology base that is coming from the Peacekeeper as well.

Senator WARNER. When you say can't accelerate, bringing in the program, a high degree of risk in certain areas and likelihood of cost overruns?

Dr. COOPER. Yes, sir, I would agree with you totally.

General RUSS. Let me comment on that a little bit.

Any program has flexibility in it. It is a matter of judgment on how fast and how slow you can do certain things in consideration of the risk.

What we did is put the best minds we have in the country together and they sat down and they looked at the small missile. They got together and said this is the most prudent pace to proceed and, that is the best way we can do it. We fully accept that.

It is still not without risk. It certainly has risk, but we believe that we have made it as short as we possibly can within the realm of reasonable risk.

Dr. COOPER. The other point I would make as well is that it is more than developing and deploying a missile or developing or deploying a system. Along with that we talk about the logistics tail, the training support, all of those things. Taken together, we are at the fastest, prudent pace.

Senator WILSON. I want to repeat I am not complaining you are moving too slowly.

Let me ask you to provide for the record an estimate of the operation and maintenance cost for what is the currently contemplated small ICBM.

Dr. COOPER. We can do that, Senator. It will come up later in our briefing. I don't have it broken in terms of O&S.

Let me give you the complete cost and this is a rough order estimate.

Our cost estimate right now to field 500 small ICBM's in a hard mobile launcher of the type we will describe shortly and to operate it for some 12½ years is something on the order of $40 billion to $50 billion in 1982 dollars.

But I am not going to hang my reputation on that particular estimate. That is where we are right now.

PERSONNEL NEEDED TO MAN 500 SMALL MISSILES

Senator WILSON. As a part of that, necessary part, I would also ask that you provide your estimate of the number of personnel that are going to be required to man and to operate and to secure the system of 500 small ICBM's.

Dr. COOPER. I will give that to you right now. It is only an estimate, but it is somewhere on the order of 15,000 to 20,000 people.

The point I would make is that when you look at a missile like the Peacekeeper or the Minuteman, I think you might see the reason why this country went to MIRV. One of the reasons is that in a system like the MIRV'd system you have a relatively few people taking care of a relatively large number of warheads.

When you go to a small missile, and we recognize that, you have a relatively large number of people taking care of a single warhead.

Senator WILSON. Then it would be a pertinent observation, would it not, to those who suggest that we replace MX with reliance entirely upon a small missile force, that to achieve the same number of warheads, what we are looking at is not $40 or $50, but $80 to $100 billion and we are looking at not 15,000 to 20,000 personnel, but 30,000 or 40,000 personnel?

Dr. COOPER. Senator, I don't think those things scale directly 1 to 1, but certainly we are looking at relatively large numbers. We would have to go back and take a look if you wanted 1,000 warheads. It does not go up one to one at that point.

Your point is well taken. We are looking at large dollars. But the reason that we are going to the small ICBM's is not for cost reasons, it is for survivability and stability, and the price tag comes along with it.

SMALL MISSILE VULNERABILITY

Senator WILSON. That takes me to my next question. It has to do with the vulnerability of the small missile.

Would you comment on what you perceive to be the vulnerability of the proposed small missile to what is admittedly a relatively modest ABM capability, but one that is fairly able to be achieved, if I am correctly advised, by wedding Soviet air-to-surface missiles with large radar?

Dr. COOPER. Senator, I don't profess to have the expertise on the Soviet ABM system, but I will tell you this.

If you raise that subject in a community of those who do have that expertise, you will touch off a debate. That debate really will center about the unknowns of the current Soviet ABM capability.

I believe you both heard General Vessey's testimony when you asked him about war gaming, and he said he who controls the assumption controls the outcome.

It is the things that we don't know about the Soviet ABM system that precludes me from giving you a precise answer.

My own view is that the Soviets have a relatively modest ABM capability today.

Senator WILSON. Let us assume they do and the assumption I am making is that we are talking about the present proposed small missile, 30,000 pounds, single warhead, with no penetration aid, isn't that duck soup even for a relatively modest ABM system?

Dr. COOPER. What I would say, and I think General Davis would be better able to answer this, that a lot of that we would handle, Senator with targeting strategy.

I think I had better not go into detail on this, Mr. Chairman, but in those heavily defended areas and assuming if the Soviets did have an adequate ABM system, we would probably choose to attack those areas that with the other part of our ICBM force and not the small missile. So, you do have some capability.

Senator WILSON. The 100 MX's?

Dr. COOPER. We also have Minuteman.

Your point is well taken with the current design constraints of 30,000 pounds on the small ICBM, we do not have a significant capability to carry the penetration aids.

Senator WILSON. I am informed by people who have been asked to do the work on it.

Dr. COOPER. I believe as the previous panel said, we really don't anticipate that the Soviets are going to have a robust ABM capability, at least in the near term.

Senator WILSON. I think what this discussion clearly implies is the need for reexamining that 30,000-pound weight constraint.

I have been told that either we are going to have to give up range or we are going to have to give up penetration aids, certainly if we continue as is presently the case with a 30,000-pound weight limit and an AIRS guidance system.

Dr. COOPER. Senator, my comment on that is I don't think we should ever preclude ourselves from going back and examining positions that have been taken. I think from the Air Force point of view with the guidance we have been given to build a 30,000-pound missile to carry a single warhead, we are capable of doing that. At least we see no reason that we can't do it right now.

Again your point is well taken that we will not have the capability on a 30,000-pound missile to carry a very extensive penetration suite.

SUPERHARDENING THE MX SILOS

Senator WILSON. Let me move to a subject now of superhardness. Mr. Sloss indicated he thought we did not enjoy the luxury of being able to do nothing, which I quite agree, but that it is clearly what we are compelled to face if we are to turn away from the MX, that there is this gap.

He indicated a greater gap between full operational capability and IOC in terms of the system.

One of the things he suggested was as time progresses, we can hope to see MX less vulnerable by two approaches, one being superhardening and the other being the application of some defensive technology, some ABM technology.

With regard to the superhardening, can you give me the cost of superhardening the MX silos?

Dr. COOPER. Again, it is a very rough estimate, but as General Fornell has testified for 50 silos hardened to levels that we would have to talk about in a classified session—but the superhard levels, we are talking on the order of $10 billion.

Senator WILSON. For what number now?

Dr. COOPER. Fifty.

Senator WILSON. That is roughly $200 million?

Dr. COOPER. Yes, sir, rough order of magnitude.

Senator WILSON. Do I understand correctly that the $200 million figure is what you are estimating the cost of superhardening to be?

Dr. COOPER. That would be the cost of what we consider to be a superhard silo. That is for 50. If you go to 100, you do recognize a little bit of economy of scale. We estimate there it is roughly $15 billion. It is in that ball park.

We have yet to build one full size, Senator, so it is hard to be precise about it.

Senator WILSON. Your estimate is $200 million?

Dr. COOPER. I want to qualify that. To build 50, our estimate is on the order of $10 billion. If you build 100, it is on the order of $15 billion. In that case it would be $150 million per silo.

Senator WILSON. At least $200 million per silo. If it is $100 million, it drops to $150 million?

Dr. COOPER. 150 per silo.

Senator WILSON. That figure strikes me as difficult to comprehend. I know we are talking about superhardening, but let me sug-

gest to you that there is a need to explain why that figure is as high as it is.

I am advised by the architects and contractors for the World Trade Center in New York that each tower cost about $200 million and that what we are talking about is over 200,000 cubic yards of concrete and over 100,000 tons of steel with all the electrical wiring, plumbing, heating, cooling systems that the highly elaborate state-of-the-art skyscraper involved. It was not cheap. It is a highly sophisticated building.

Why is it cheaper to build a tower in the World Trade Center than it is to superharden a single silo?

Dr. COOPER. To start out, the World Trade Center is not superhardened, Senator. As sophisticated as the World Trade Center might be, it is not as sophisticated as a superhardened silo.

General Fornell can address that more in his briefing. The silo is more than just concrete and steel. It is a very sophisticated piece of equipment. But that is our best estimate right now.

As I say, all we have built is a scale model. We have yet to build a full-scale model, but it is on that order.

Senator WARNER. My recollection is that you gave a higher figure than the $200 million?

Dr. COOPER. No, sir. I think what General Fornell said was roughly $9 billion for 50 silos. I don't care to give it that much precision. I would rather go around $10 billion.

Senator WILSON. Aren't we talking about roughly a third of the amount of concrete and steel in one of these silos that was involved in one of the towers at the Trade Center?

General FORNELL. I don't know what the Trade Center specifics are. I think the cost is probably in terms of 1960's dollars. Of course, superhard silos costs are a total program cost. There is a significant amount of research and development that goes into establishing the nuclear criteria, examining the physics of the problem and building a very resilient structure.

There is no research and development, I am sure, in that World Trade Center tower, that is, the concrete, mortar, wiring, et cetera, that goes into it, whereas we have to devote ourselves to a full-scale development program to adapt specifically to a given missile system and then deploy and build the system as we described.

But there are uncertainties there and this estimate is preliminary. We are in an evolving technology right now with a good bit of activity which changes; in fact, the design has changed even in the last year as far as our initial understanding of what a resilient structure would take.

There are other things that must be done as well. That is in the shock isolation system, very exotic, you just have a balanced system hardness to match that hardened concrete and steel structure in the system. You are only as strong as your weakest link, challenges also remain in the communications and control effort, since that must survive great overpressures too.

There is a good bit of excavation for a superhard silo and the World Trade Center is built above ground and in a fairly simplified construction mode. This is all built underground and requires a rather extensive excavation to facilitate the construction of that facility.

Again, those are rough estimates, Senator Wilson, our best guess today.

Senator WILSON. What is the source of your estimates? Are you going to go to bed on this?

General FORNELL. Sir, we have a research and development program underway, of course, to do these tests. That is contracted and competed out. These estimates originate at the Ballistic Missile Office which is the responsible agency for conducting these tests in a joint venture with the Defense Nuclear Agency which participates in the physics of the question.

We look at it from an Air Force point of view in a more systemized standpoint as far as making a survivable system work and communicate with the remainder of our strategic forces.

Senator WILSON. I think that no one can accuse you of mothballing it. I simply suggest that my skepticism is shared by another person who is distinctly interested in that and that is the Secretary of State who pointed out in a conversation we had, who used to be in the concrete and steel business, he finds the estimate mind boggling.

I know you are not here to spend any more than is required, but since super-hardening is very directly relevant to this whole discussion, I would hope that there is some review of those figures. I really can't conceive of their being that expensive.

Dr. COOPER. What I might add is that I think we will be able to refine our estimate as time goes on. We are not in a position today to recommend to you that we deploy a hardened silo. We have only tested scale models. It will be several years before we are faced with a decision to deploy, and we will have more information at that point in time.

Again, I want to cast this as a rough order of magnitude. We are talking on the order of $10 billion. That is the best we can do right now.

Senator WILSON. Thank you very much.

In the report that has just been issued today, I believe the President's report on continuing acquisition of the Peacekeeper, there is reference made to preparation of a legislative environmental impact statement by late 1986.

Am I correct in my assumption that what you are talking about is a normal environmental impact statement?

ENVIRONMENTAL IMPACT STATEMENT

General FORNELL. The legislative EIS, or environmental impact statement, is a second type of process that can take place to support a major weapon system decision.

The other is a full administrative environmental impact statement. One involves the public in every turn of events.

Senator WILSON. That is administrative?

General FORNELL. Yes, sir, administrative requires scoping hearings, public hearings. In order to support, as you indicated, these major decisions, we have to consider the environmental impact as we go through that process.

Because we are now researching alternatives, we are examining options, the system is not that clearly defined where we can use

our interrelationship between the Congress and the Department of Defense in supporting these major decisions leading up to the deployment.

That means that for the full-scale development decision on small missiles, on a basing technology perhaps in later years, those would be supported with legislative EIS. But before any deployment would take place, we would submit to a full administrative EIS process, scoping meetings, public hearings and mitigating impacts that are raised during the public hearings.

General RUSS. I believe if we went through the full administrative EIS completely, we would not be able to field the small missiles in the time frame we are talking about now. So, we are trying to compact everything to make as short a time frame as possible.

Senator WILSON. General, in my experience of 11 years in local government if you had to go through the same kind of procedure to develop an environmental impact approval, God help the defense posture.

General RUSS. We went through that on our initial try attempting to field the MX missile in the early days when we were looking at the early basing. I will tell you that the price of the environmental impact statement, I think one of them was $30 million.

We have studies over there that have to do with environmental impact that would fill half of this room. It is a very laborious and costly and time-consuming job to do all of that. It tends to take longer than even the timetable that is laid out in the normal regulations.

General FORNELL. Senator Wilson, to point out, when I was describing Wyoming, we went through a full administrative EIS for our MX Peacekeeper deployment in existing Minuteman silos, public scoping hearings, public hearings, and filed with the EPA which we accomplished right on the target date a little over a year ago.

That is accomplished, a very key ingredient in fielding a strategic system in particular.

Dr. COOPER. Senator Warner, I think it started during your days as Secretary of the Navy, you may remember the old Seafarer system, extremely low frequency submarine communications system.

It is a very arduous and tedious process and controversial.

Senator WARNER. It sure is. They have my sympathies. As costly as it is, as General Russ pointed out, the greatest cost is time. We spend several hundred thousand dollars studying the impact on the sex life of the worm. The Federal Government is even sillier than local government.

Dr. COOPER. That is exactly why we solicit your support on our legislative EIS.

Senator WARNER. Mr. Secretary, we have a problem. This subcommittee has been in session on and off for almost 6 hours today. There are some details that I have to attend to, not the least of which is meeting with the President in 40 minutes on this subject.

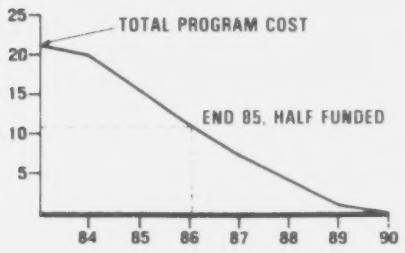
We have two options: Recalling the panel to complete the record or, as I understand counsel for the subcommittee, the remainder of your direct presentation is basically factual data and could be put in the record.

Dr. COOPER. Yes, sir, it could and I think it is a good news story. We will be happy to supply it for the record.

[The information follows:]

PEACEKEEPER FUNDING STATUS

(BILLIONS OF THEN-YEAR DOLLARS)



The total Peackeeper program will cost $21.6 billion. With the fiscal year 1985 funding, the program will be half complete. The bulk of the research and development investment will have been made and from now on, we can reap the benefits of that substantial investment.

FUNDING STATUS FOR FY 85
PEACEKEEPER PROCUREMENT

FIRST INCREMENT – $1.0 BILLION
- BASING PRODUCTION FOR FY 84 MISSILES
- INITIAL SPARES FOR FY 84 MISSILES
- LONG LEAD ITEMS FOR FY 85 MISSILES

SECOND INCREMENT – $1.5 BILLION
- 21 ADDITIONAL MISSILES

Funding for fiscal year 1985 was divided into two increments. The first increment for $1.0 billion was available last October and is for the basing production and initial spares for the missiles we bought in fiscal year 1984. In addition, $60 million is available for long lead items necessary for the fiscal year 1985 missiles. By the end of this month, we will have obligated, that is signed production contracts, and made the U.S. Treasury liable for, more than 90% of the $1.0 billion. The remaining $1.5 billion which is fenced by the Congress is for producing 21 additional missiles.

SUMMARY OF PRESIDENT'S REPORT

- FINDINGS
  - SOVIET BUILDUP CONTINUES
  - SCOWCROFT COMMISSION RECOMMENDATIONS REMAIN VALID
  - DELAY OR CANCELLATION OF PEACEKEEPER WOULD SEVERELY UNDERCUT NEGOTIATIONS IN GENEVA
- CONCLUSIONS
  - PEACEKEEPER SUPPORTS NATIONAL SECURITY OBJECTIVES
  - PEACEKEEPER IS CONSISTENT WITH U.S. ARMS CONTROL POLICY
  - PEACEKEEPER CONTRIBUTES TO GLOBAL SECURITY

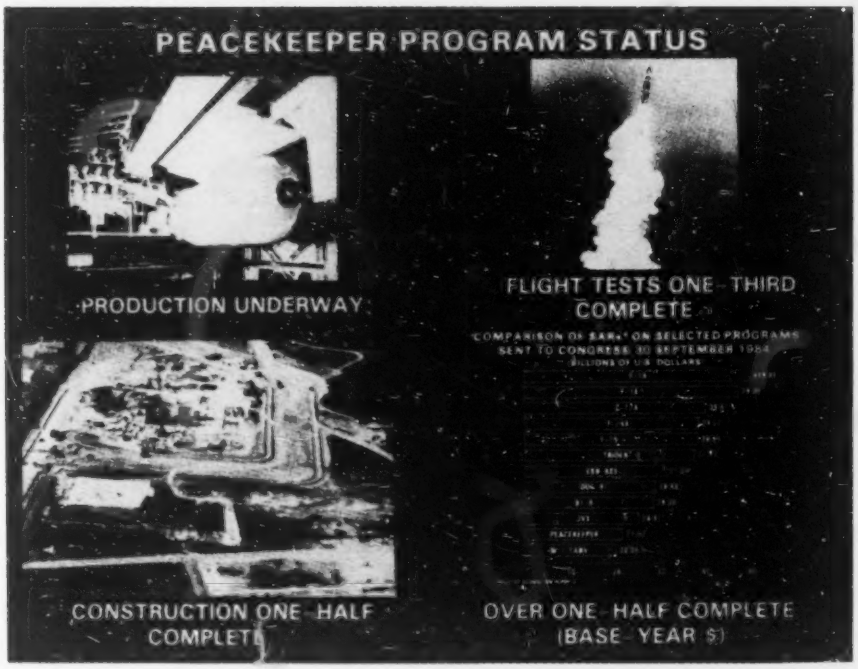
To comply with the requirements for the release of the $1.5 billion, the President submitted a report to the Congress on 4 March. He ascertained that the Soviet military buildup is continuing, that the 1983 Scowcroft Commission recommendations remain valid and that a delay or cancellation of Peacekeeper would severely undercut the arms control talks in Geneva. The President concluded that Peacekeeper supports national security objectives, is totally consistent with the U.S. arms control policy and agreements and that Peacekeeper contributes to global security by enhancing deterrence.

FY 86 PEACEKEEPER PROCUREMENT

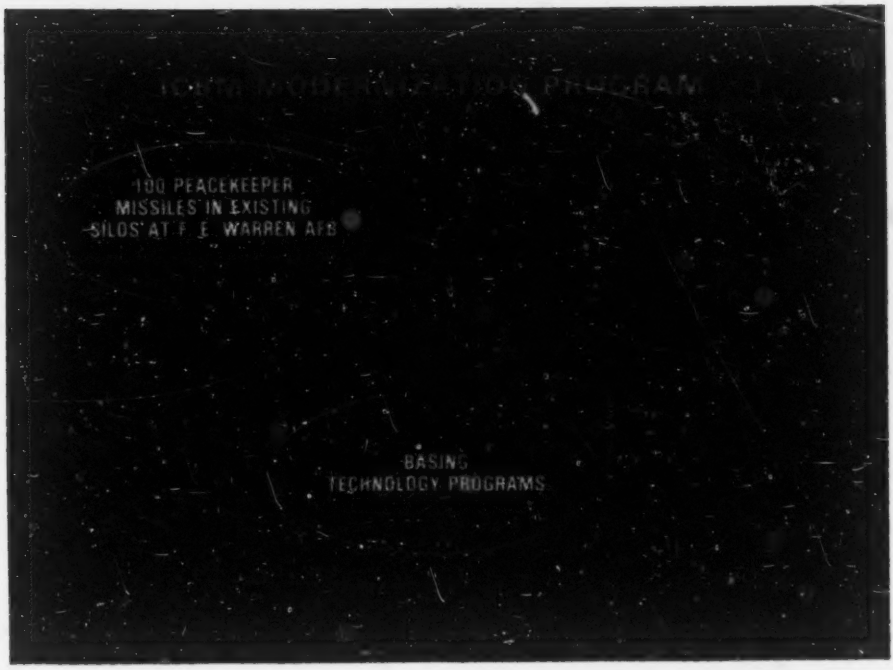
REQUEST BUYS
- 48 MISSILES
- INITIAL SPARES
- BASING
- SUPPORT

WITH FY 86 PROCUREMENT, AIR FORCE CAN
- PUT 77TH PEACEKEEPER ON ALERT
- START SAC's OPERATIONAL FLIGHT TEST AND EVALUATION PROGRAM
- START AFLC's AGING AND SURVEILLANCE PROGRAM

Our fiscal year 1986 request in procurement will buy 48 additional missiles, initial spares, and basing and support to continue deploying missiles in Minuteman silos. With fiscal year 1986 procurement, the Air Force can posture the 77th Peacekeeper to alert status, and start the test programs for reliability to ensure that the new weapon system can perform as required.



To summarize the Peacekeeper program, then, our flight test effort is over one-third complete and is successful, missile and basing production are underway, and construction in the deployment area is about one-half complete. The program is on schedule and on target in terms of cost. Looking at all the DOD programs over $20 billion, the Peacekeeper is 11 out of 12, just ahead of the M-1 tank.



The second recommendation of the Scowcroft Commission was to pursue development of a small, single-warhead ICBM which is survivable.

SMALL ICBM

($ IN MILLIONS)

	FY 84	FY 85	FY 86	FY 87	FY 88 - FY 90	TOTAL
RDT&E	328.4	461.5	624.5	TBD	TBD	TBD

FY 86
RDT&E REQUEST
$ 624.5

SCHEDULE

• CONCEPT DEFINITION PHASE	NOV 83
• PRE-FSD PHASE	JAN 85
• FSD	OCT 86
• IOC	DEC 92

With fiscal year 1986, our Small ICBM program is in its third year. The request is for $624.5 million in research and development.

LEGISLATIVE DIRECTION

- PRICE AMENDMENT
  - –30,000-LB MISSILE
    - SEC DEF REPORTS WEIGHT OVER 30,000 LB TO CONGRESS
  - –10 PEACEKEEPERS/SMALL MOBILE ICBM SUBSYSTEMS TESTS
  - –40 PEACEKEEPERS/SMALL MOBILE ICBM SYSTEMS INTEGRATION AND FLIGHT TEST
- GLENN RESOLUTION
  - –SMALL MOBILE ICBM: HIGHEST NATIONAL PRIORITY (LIKE PROJECT APOLLO)

The Small ICBM program has received very specific legislative direction. Two years ago, the Price Amendment defined the weight of the missile as 30,000 lbs and linked certain Small ICBM testing milestones to Peacekeeper deployment milestones. In addition, the Glenn Resolution stressed the national importance of a small mobile ICBM. The Air Force is complying with both these directives and is stepping out smartly in the pursuit of the small ICBM.

THE SMALL ICBM PROGRAM

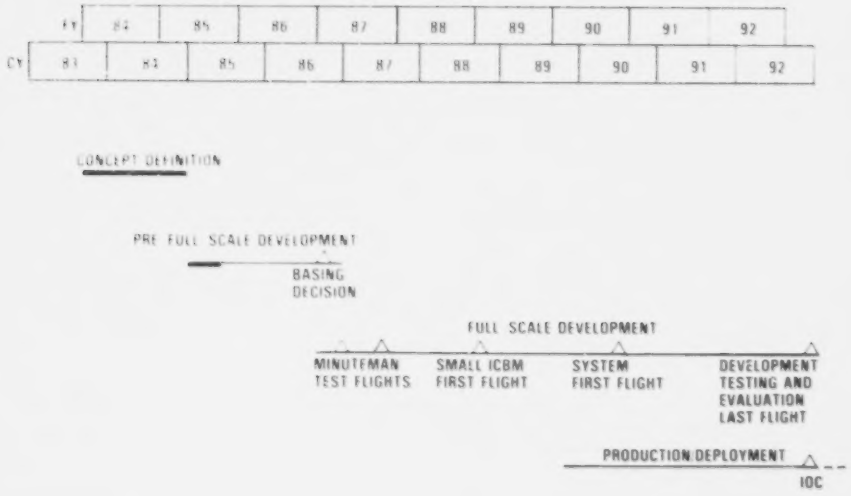
- LOW TARGET VALUE
- STABILITY
- SURVIVABILITY
- DEPLOYMENT FLEXIBILITY

- DEPENDENT ON PEACEKEEPER
  - –FOR SUBSYSTEM DEVELOPMENT TO REDUCE SYSTEM COSTS AND MAINTAIN ACCELERATED SCHEDULE
  - –TO MAINTAIN TARGETING FLEXIBILITY
  - –AS AN INCENTIVE TO MOVE TOWARD STABILITY AND ALL THE ADVANTAGES OF THE SMALL ICBM

The Small ICBM possesses certain traits that make it much different than a MIRVed missile in a silo like Peacekeeper. Because it has only one warhead, the Small ICBM has low target value since one attacking warhead destroys only one warhead. The Small ICBM contributes to stability because it will move the Soviet reliance away from large MIRVed missiles toward single warhead missiles.

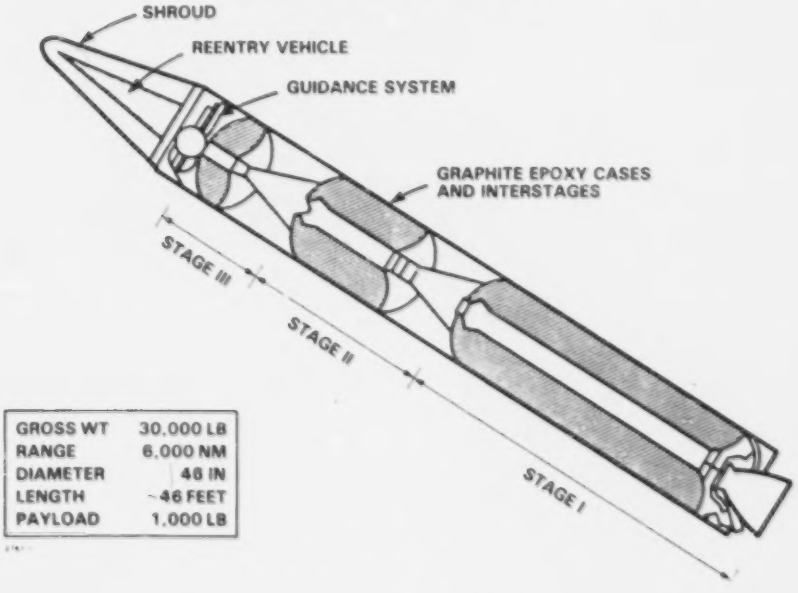
The program's main objective is to increase the survivability of the land based ICBM so that an attacker cannot be confident of success. Using a small missile also permits one or more basing modes to be considered. The Small ICBM is dependent upon the Peacekeeper program. Development of some Peacekeeper subsystems will shorten the development time necessary for the Small ICBM. Peacekeeper is still necessary in the near term to redress the prompt countermilitary asymmetry between Soviet and U.S. ICBMs. Finally, Peacekeeper is needed to convince the Soviets that we have a will to modernize our ICBMs and that moving toward the stability of fewer nuclear warheads is in their best interests.

SMALL ICBM PROGRAM SCHEDULE


FY 84 85 86 87 88 89 90 91 92
CY 83 84 85 86 87 88 89 90 91 92
CONCEPT DEFINITION
PRE FULL SCALE DEVELOPMENT
BASING DECISION
FULL SCALE DEVELOPMENT
MINUTEMAN TEST FLIGHTS
SMALL ICBM FIRST FLIGHT
SYSTEM FIRST FLIGHT
DEVELOPMENT TESTING AND EVALUATION LAST FLIGHT
PRODUCTION DEPLOYMENT
IOC

The program entered the concept definition phase in fiscal year 1984 and is currently in pre-full scale development. A basing decision and the entry into full scale development will occur at the end of 1986. The initial operational capability is planned for 1992.

MISSILE CONCEPT



The missile concept calls for a three-stage, 30,000 lbs missiles with a 6,000 nm range and a 1000 lbs payload. Part of the acquisition strategy is to provide for maxi-

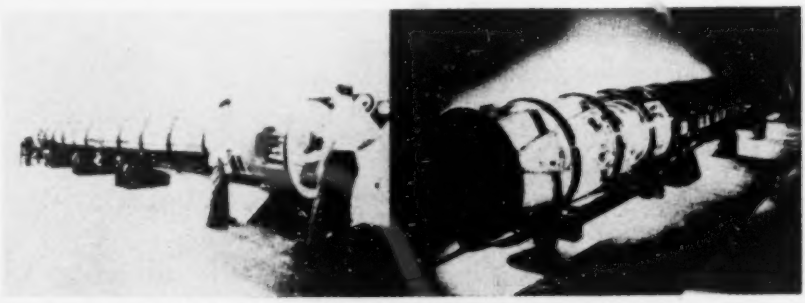
mum competition in the early phases of development to arrive at the best design solutions with the greatest cost effectiveness.

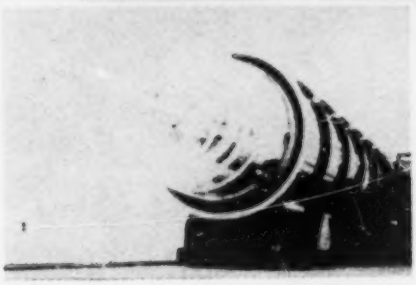
SMALL ICBM MAJOR CONTRACTORS

• WEAPON SYSTEM/MISSILE CONCEPT DEFINITION	BOEING, McDONNELL DOUGLAS, MARTIN MARIETTA, GENERAL DYNAMICS
• BOOSTER DEFINITION	HERCULES, THIOKOL, UNITED TECHNOLOGIES, AEROJET
• GUIDANCE INTEGRATION	AUTONETICS
MODIFIED AIRS	NORTHROP
ALTERNATE INS RING LASER GYRO – STELLAR INERTIAL	LITTON INDUSTRIES, HONEYWELL, GENERAL ELECTRIC
• HARD MOBILE LAUNCHER	MARTIN-MARIETTA, BOEING
HARD SILO	KAISER, PARSONS, BRINKERHOFF, QUADE, AND DOUGLAS (WEIDLINGER ASSOCIATES), BOEING
COMMAND, CONTROL, AND COMMUNICATIONS	GTE SYLVANIA

Our Small ICBM contractor team is broad-based and we have competition in concept definition, missile booster definition, various guidance alternatives, and various basing mode alternatives.

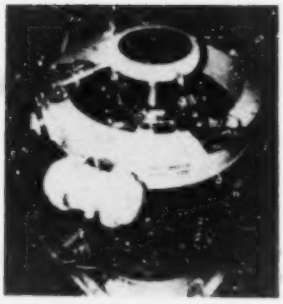
FULL-SCALE MOCK-UP OF SMALL ICBM





One of our missile concept definition contractors, McDonnell-Douglas has fabricated this full scale mockup of a Small ICBM.

SMALL ICBM ROCKET MOTOR TEST



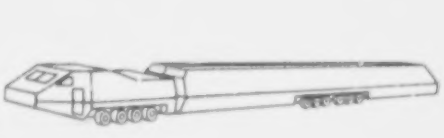
One of our booster definition contractors, United Technologies, has conducted rocket motor tests to demonstrate the appropriateness of certain materials to decrease booster weight, yet withstand tremendous heat and vibration stress.

BASING CONCEPTS

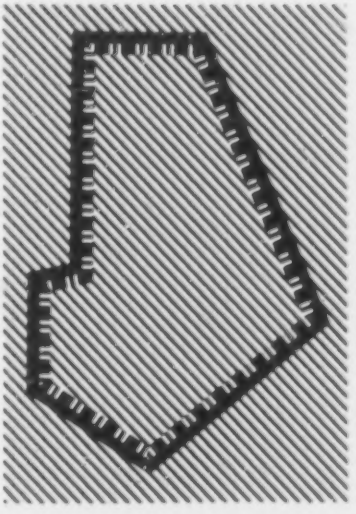
HARD ROAD MOBILE	DEPLOY ON DOD LAND HARDNESS AND MOBILITY FOR SURVIVABILITY 30 PSI OR GREATER HARDNESS
SUPERHARD SILO	DEPLOY ON EXISTING MINUTEMAN SITES OR NEW AREAS WITH GOOD GEOLOGY FIXED AND MOBILE CONTROL CENTERS SITE SECURITY LIKE MINUTEMAN
SOFT ROAD MOBILE	1 MISSILE PER TRUCK CONTINUOUSLY MOBILE USES MAJOR U.S. HIGHWAY SYSTEMS SUPPORTED BY 8-10 MAJOR DOD INSTALLATIONS

Three basing concepts are currently being examined by the Air Force for the Small ICBM. The hard road mobile concept is deployed on Department of Defense land and achieves its survivability through a combination of hardness and mobility. The superhard silo concept could be used at existing Minuteman silos or at new sites and operations and maintenance would be much like that for our Minuteman system. The soft road mobile mode uses a move-park-move mode with over-the-road type trucks and achieves its survivability by being highly mobile and widely dispersed.

SMALL SURVIVABLE ICBM— HARD MOBILE BASING

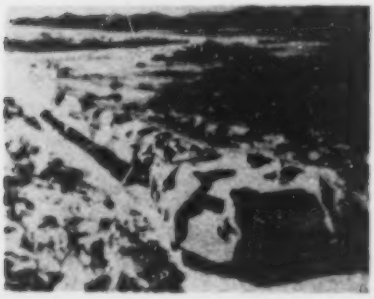


- PEACETIME
  - ALL MISSILES AND TRANSPORTERS ON DOD BASES
  - DISPERSED TO SURVIVE SLBM ATTACK
- INCREASED TENSION
  - DISPERSE INTO MISSION CONFLICT AREAS
- CONFLICT APPEARS IMMINENT
  - DISPERSE TO WIDE AREA FOR SURVIVABILITY

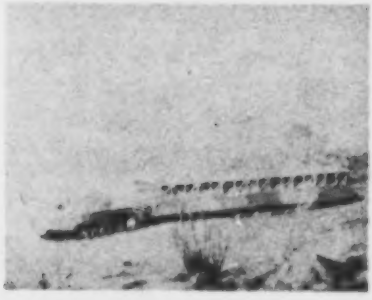


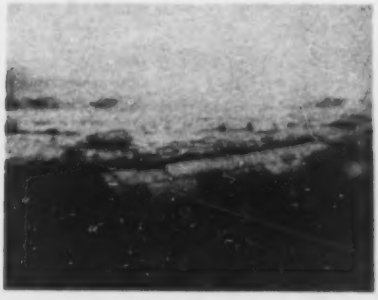
The operations concept for the hard mobile mode varies as the threat to survivability changes. During peacetime, the missiles are all located on DOD bases and are dispersed to survive an SLBM attack. If tension increases, the transporters would disperse into DOD areas that are used for other purposes during peacetime. If conflict appears imminent, the transporters would disperse to a wider area to complicate the attacker's targeting problem.

HARD MOBILE LAUNCHER CONCEPTS



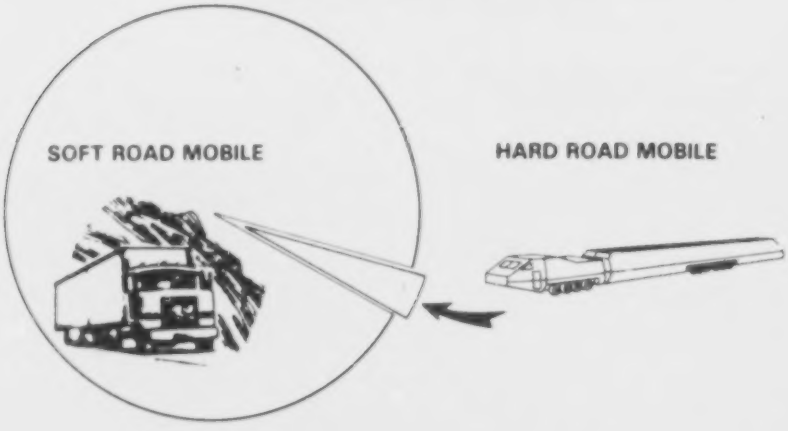
- GROSS WT: 150,000
- WIDTH: 12 FT
- 30 PSI HARDNESS
- PERFORMANCE
  - –60 MPH–HIGHWAY
  - –30 MPH–DIRT ROAD
  - –15 MPH–OFF ROAD





The hard mobile launcher would weigh about 120,000 lbs. With the missile, the total would be 150,000 lbs. It possesses levels of hardness that, combined with mobility, make the system survivable against an attack.

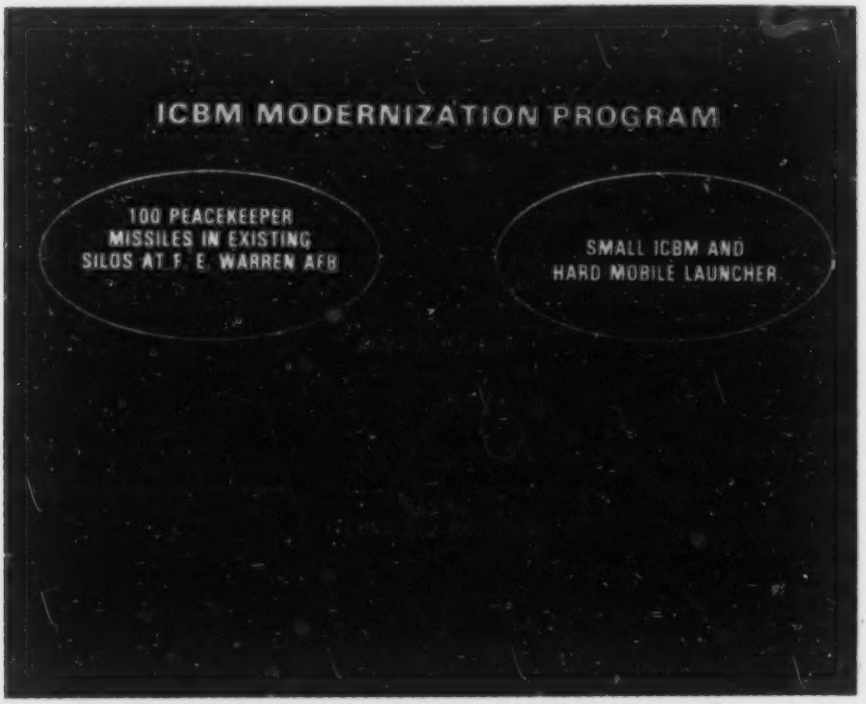
COMPARISON OF LAND AREA REQUIRED FOR SURVIVABILITY



HARD ROAD MOBILE REQUIRES 4 PERCENT OF THE LAND AREA NEEDED FOR SOFT ROAD MOBILE

Because the soft road mobile transporter possesses little hardness compared with the hard mobile launcher, a much wider land area is required for the soft mobile

system. The hard mobile system requires only 4% of the land needed for the soft mobile system to achieve comparable survivability.


ICBM MODERNIZATION PROGRAM
100 PEACEKEEPER MISSILES IN EXISTING SILOS AT F. E. WARREN AFB
SMALL ICBM AND HARD MOBILE LAUNCHER

The third recommendation of the Scowcroft Commission was to pursue basing technologies that could be applicable to either the Peacekeeper or the Small ICBM.

FOLLOW-ON BASING TECHNOLOGIES

($ IN MILLIONS)

	FY 84	FY 85	FY 86	FY 87	FY 88 - FY 90	TOTAL
RDT&E	139.0	179.8	172.2	TBD	TBD	TBD

FY 86
RDT&E REQUEST

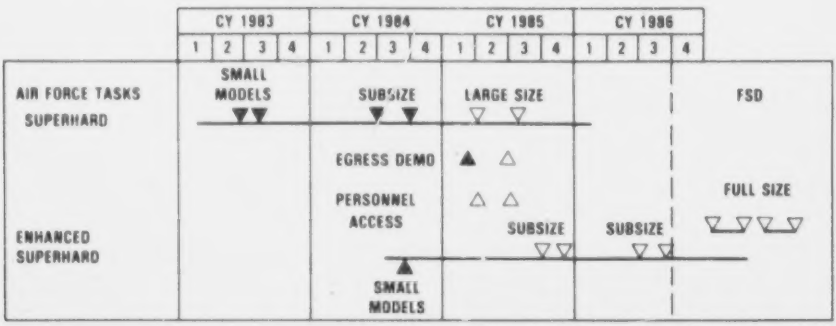
$ 172.2

SCHEDULE

• RESEARCH CONTINUES FY 86

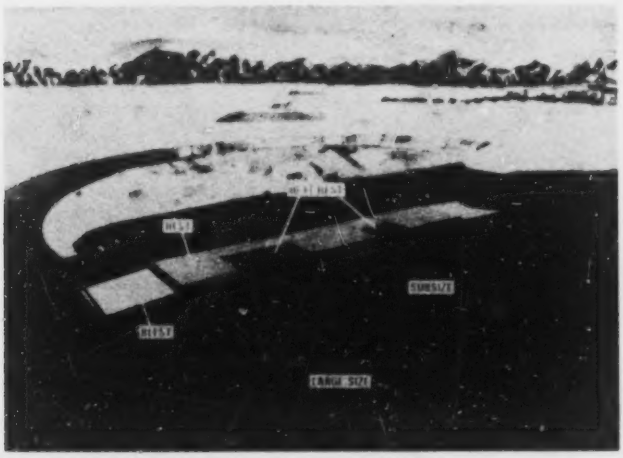
Like the small ICBM program, 1986 marks the third year of effort. The request for fiscal year 1986 is $172.2 million.

PLANNED HARDENING TECHNOLOGY PROGRAM



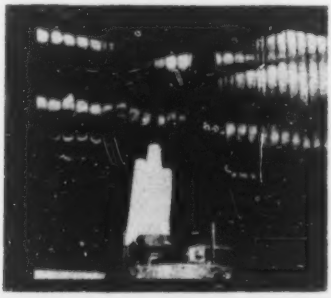
The hardening technology program is progressing on schedule. To date, we have been testing at hardness levels that just a few years ago were deemed unachievable. Our program is a joint effort with the Defense Nuclear Agency. The first two in a series of tests have been conducted in the past year as well as tests on system components. Our fiscal year 1985 and fiscal year 1986 efforts will continue to reduce the uncertainties of constructing superhard structures to permit them to sustain high overpressures.

ICBM SILO SUPERHARDENING LARGE SIZE 1 TEST



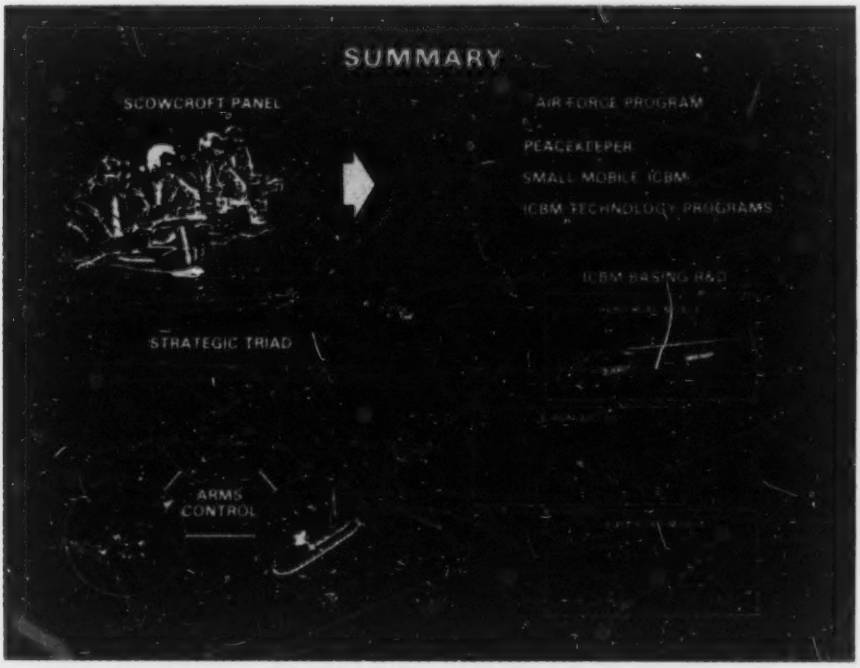
Our first large size test will be conducted this Spring at the Luke AFB Bombing and Gunnery Range near Yuma, Arizona. It involves using high explosives to simulate the overpressures of a nuclear event.

ADVANCED STRATEGIC MISSILE SYSTEMS (ASMS)



- CONTINUING ICBM ADVANCED DEVELOPMENT PROGRAM
- DEVELOPS AND APPLIES TECHNOLOGIES FOR OPERATIONAL ICBM SYSTEMS
- GROUND AND FLIGHT TESTING PREPARES SYSTEM/SUBSYSTEM FOR FSD
- FY 86: PROGRAM FOCUSES ON ICBM PENETRATION AND ADVANCED REENTRY SYSTEMS

One additional research and development area is in advanced strategic missile systems. The fiscal year 1986 request is for $173.9 million. This is a continuing advanced development program that applies technologies for operational systems. For fiscal year 1986, the program focuses on ICBM penetration and advanced reentry systems.



In summary, in 1983, the Scowcroft Commission recommended an ICBM modernization program with three elements: Peacekeeper deployment; small mobile, single-warhead ICBM development and follow-on basing technology development. Our basing efforts for the Small ICBM are focused in hard road mobile, superhard silo

and soft road mobile modes. It is through these efforts that we are enhancing the ICBM leg of the Triad and therefore the Triad as a whole. This ICBM modernization program is carefully woven into the objectives of our arms control efforts. I urge your continued support.

Senator WARNER. I don't wish to have the Department of the Air Force understand there is a lack of interest in the two programs. If it is your desire to have a further session, I will accommodate you.

Dr. COOPER. Mr. Chairman, if I might caucus for just a moment?

Senator WARNER. I am not trying to make this decision abruptly. You caucus and report back to me through the staff at your convenience.

If that is agreeable, we will conclude this subcommittee hearing today subject to call of the Chair.

I thank you, Mr. Secretary, General Russ and General Fornell.

Dr. COOPER. Mr. Chairman, it is always a pleasure to appear.

Again, let me once more thank you for your efforts on behalf of the Strategic Modernization Program.

Senator WARNER. Thank you.

[Questions with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR JOHN WARNER

ICBM FORCE

Senator WARNER. Dr. Cooper (Panel): Could you comment on the current condition of the Minuteman force in terms of aging, performance or other similar considerations? Can you put the planned ICBM modernization program in the context of the long range plans for the Minuteman force?

Dr. COOPER. Minuteman II and Minuteman III continue to be reliable and effective weapon systems. This is constantly reaffirmed by our operational testing and assessment programs. Though portions of the ground systems are 23 years old, and the oldest Minuteman IIs and IIIs are 20 and 15 years old respectively, we are vigorously working to keep them reliable and supportable. Present programs include those designed to: ensure that the weapon system remains logistically supportable; correct accuracy degradation of the Minuteman II guidance set; and correct aging problems associated with Minuteman III stage 2 and 3 and Minuteman II stage 2 motors. RIVET MILE, the Minuteman Integrated Life Extension program, is designed to refurbish the ground facilities. Through these and other similar programs, we will be able to maintain the entire Minuteman force in its historically high on-alert rate. Though portions of the Minuteman force may be replaced by the Peacekeeper and new Small ICBM we plan for Minuteman to be an important part of the strategic force structure into the twenty-first century. The Air Force Chief of Staff has repeatedly stated that he views Minuteman improvements as a good complement to the strategic modernization program. In that regard, we have implemented programs to ensure continued effectiveness of Minuteman. For example, Minuteman III accuracy has been improved by 33 percent, innovative command and control technology derived from the strategic modernization program is being incorporated into the Minuteman system, and we are developing state-of-the-art penetration aid systems to counter future advances in Soviet anti-ballistic missile capability. In summary, the Minuteman system is effective and fits firmly into our plans for strategic modernization.

SUPERHARD SILOS FOR PEACEKEEPER

Senator WARNER. Dr. Cooper (Panel): How do you assess both the technical prospects for and the military utility of eventually deploying Peacekeeper missiles in superhard silos? Do the designs now under construction introduce any new factors such as timeliness of launch?

Dr. COOPER. The hard silo program is a technology program that is approximately 50% complete. The results to date have been very encouraging, and it is clear that we can build very hard silos. The most cost-effective and minimum risk method to proceed is not yet clear. The designs we are pursuing make use of advances in several areas of technology such as stronger concrete, high steel content, advanced struc-

tural designs developed as a result of better understanding nuclear effects, and a better understanding of cratering effects in varying geological conditions.

The survivability of Peacekeeper in existing Minuteman silos will be adequate, especially considered in the context with the rest of our strategic forces, to maintain deterrence for some time. However, it is clear that the Soviets are continuing to seek ways to eventually stress even our diverse Triad in the future. Thus, the availability of this hard silo technology for deployment should coincide with the time period during which its application will be most needed.

At this stage in the development program, various hard silo designs are evolving. In all cases, the short launch time requirement of our current ICBM forces is being maintained as a requirement for hard silos.

CONSTRAINTS TO THE SMALL ICBM

Senator WARNER. Dr. Cooper (Panel): Congressional direction has constrained the small ICBM to 30,000 pounds (with the possibility of a ten percent margin). In your judgment, what has been the effect of this constraint in terms of designing a missile that meets current and projected military requirements?

Dr. COOPER. The 30,000 pound limit presents a challenging systems engineering effort, but one which has reasonably high confidence of success. This weight limit requires development of advanced, lightweight, and more accurate guidance and control systems; lighter and higher strength motor cases; lighter, thinner, and stronger motor insulation material; advanced, lightweight ordnance systems; and more energetic propellants. It will require the Air Force to conduct a very aggressive, fast-paced full scale engineering development program to develop and deploy the 30,000 pound Small ICBM in December 1992.

SMALL ICBM AIRS GUIDANCE

Senator WARNER. Dr. Cooper (Panel): One of the significant cost issues concerning the small ICBM is the AIRS guidance. As you are aware, the development program is exploring the possibility of alternative guidance systems that may be less expensive, but also may be somewhat less accurate than the AIRS. How do you view these tradeoffs between affordability and accuracy performance?

Dr. COOPER. The President's Commission on Strategic Forces (Scowcroft Commission) stated that the Small ICBM should be capable of "holding Soviet hard targets at risk". This requirement, considered in the context of a 15 ton class missile requires an extemely accurate guidance system. The Small Missile Independent Advisory Group, headed by retired Air Force General Bernard Schriever stated that "guidance and control is the most challenging development required for the Small ICBM." This advisory group recommended that the Air Force pursue development of a modified lightweight version of the Advanced Inertial Reference Sphere (AIRS) system developed for the Peacekeeper, due to its superb accuracy results.

Furthermore, the recommendation was made to conduct a strong guidance technology program to develop and validate systems that could reduce costs or improve performance. Until we see results of the alternate guidance programs, it is not possible to speculate on the outcome of the competition between modified AIRS and the alternatives.

The Small ICBM version of the AIRS system is now projected to cost less than the Peacekeeper AIRS and it appears that it will be competitive with the alternate systems in a cost comparison. To be a viable military system, the Small ICBM must be capable of performing its required mission and it must be very accurate to do so. Therefore, accuracy performance will be a critical factor in the competition.

SOVIET PREPARATION OF AN ABM DEFENSE

Senator WARNER. Are you concerned by what appears to be Soviet preparation of an ABM defense of their national territory? What would be the impact of such defenses on your confidence in your ability to successfully execute U.S. war plans?

Dr. COOPER. We have long been concerned by the extensive effort the Soviets are expending on ballistic missile defenses and technology, both in actual deployment around Moscow, and in research and development which would permit more extensive deployment. Although we believe the probability the Soviets will abrogate the ABM Treaty in the 1980s is [deleted]. We have research and development programs underway that would allow us to mitigate, although possibly with some delay, the adverse impact of a Soviet deployment of a nation-wide defensive system.

PENETRATION CAPABILITIES

Senator WARNER. Dr. Cooper (Panel): The Committee has received several briefings that point to the possibility of expanded Soviet ballistic missile defenses, either with dedicated systems, or with air defense with anti-ballistic missile capabilities. What is your assessment of this possiblity, and what is your judgment concerning the pace and emphasis of penetration aid programs now underway or requested for ICBMs?

Dr. COOPER. The current Soviet system, the [deleted] is deployed around Moscow. This system includes [deleted].

Upgrades to the ABM system in the [deleted].

The pace and emphasis of our current programs are sufficient to address the threat. We have invested in research and development programs that will provide the technology and advanced development necessary for penetration options to counter, in a timely manner, potential Soviet defensive capabilities. The Advanced Strategic Missile Systems (ASMS) program is currently conducting advanced development on a penetration aid system that includes decoys, advanced radar chaff, and a deployment system that is applicable to current and future ICBMs. This system is being designed to [deleted].

ASMS is also evaluating advanced penetration concepts, including maneuvering reentry vehicles capable of evading interceptors, defense suppression vehicles, and [deleted] penetration aids, to address a spectrum of potential Soviet advanced ABM capabilities.

OPERATIONAL TEST MISSILES FOR MX

Senator WARNER. Dr. Cooper (Panel): Some have suggested that significantly curtailing the operational test program is one way to reduce the costs associated with Peacekeeper. From your perspective, how would such a reduction affect your confidence in the operational performance of the missile? Are there any conditions under which you would recommend reducing the number of operational test missiles? Are the number of operational tests required independent of the total number of missiles deployed?

Dr. COOPER. The number of operational test missiles required is independent of the total number of missiles deployed. Whether 21 or 100 missiles are deployed, it is critical to have confidence in system performance for the Single Integrated Operations Plan. Therefore, reducing the confidence in this weapon system or any strategic weapon system, is not a prudent approach for management of national security matters. The Peacekeeper operational test program is sized to meet the Joint Chief's of Staff guidelines for strategic weapons. The total program is 108 missiles. Trident I and Pershing II test programs contain 334 and 110 missiles, respectively. To reduce the Peacekeeper operational test program would not be a prudent approach for the only system that can promptly hold the highest value Soviet targets at risk.

SURVIVABILITY

Senator WARNER. Dr. Cooper (Panel): In the President's report on the release of the fiscal year 1985 funding for MX, it states that from a technical viewpoint the vulnerability of Peacekeeper missiles based on existing Minuteman silos will be roughly similar to the currently deployed Minuteman ICBMs. Do you agree with that assessment?

Dr. COOPER. Yes. As addressed in the President's March 1985 report, "From a technical or engineering veiwpoint, the vulnerability of Peacekeeper missiles based in existing Minuteman silos will be roughly equivalent to the Minuteman ICBMs currently deployed in those silos.

The question of force survivability, however, is not the same as that of silo vulnerability. Because the three legs of our Triad each have different characteristics, a Soviet planner seeking to construct an attack against U.S. strategic forces faces significant problems."

As the Scowcroft Commission noted: "...the different components of our strategic forces would force the Soviets, if they were to contemplate an all-out attack, to make choices which would lead them to reduce significantly their effectiveness against one component in order to attack another."

As a result, the Commission concluded that: ". . . the vulnerability of such silos in the near term, viewed in isolation, is not a sufficiently dominant part of the overall problem of ICBM modernization to warrant other immediate steps being taken . . ."

The capability of Peacekeeper to place at risk even the hardest targets will strengthen substantially our ability to deter nuclear attacks. Peacekeeper's ultimate

survivability resides in its ability to deter attack in the first place—and, thereby, increase the survivability of not only Peacekeeper but the entire Triad as well.

QUESTION SUBMITTED BY SENATOR DAN QUAYLE

REPORT ON NUCLEAR WINTER

Senator QUAYLE. Mr. Cooper: Last Friday DOD released its report to Congress on nuclear winter and its implications. Although the report emphasized that there are many critical uncertainties concerning nuclear winter, it made sense to hedge our bets by promoting the development of more accurate missiles and more discriminate warheads. Terminal fixing MaRVs, earth penetrating warheads, lower yield nuclear warheads, and nonnuclear ballistic missiles were programs mentioned in the report yet there is nothing in your testimony concerning any of these efforts. Could you please detail for the record what is being spent on each of these efforts, what IOC you expect for each, and what specific missile each effort is or will be associated with.

Dr. COOPER. Although there have been studies and limited technology development on these concepts, there are no ongoing Air Force efforts that are focused on an IOC for a specific weapon system.

The Advanced Strategic Missile Systems (ASMS) program is currently evaluating maneuvering reentry vehicle (MaRV) technology that can incorporate a terminal fix guidance system (TFS) as an option for the late 1990s. In fiscal year 1986, ASMS will spend approximately $37 million to conduct aircraft captive carry flight tests of TFS candidates and continue with preliminary MaRV vehicle designs.

The Department of Energy is evaluating both earth penetrating and lower yield warhead technologies. A key to reducing weapon yields while continuing to meet damage requirements is increased accuracy. If the accuracy is improved sufficiently, and operational requirements dictate, the Air Force could initiate developmental efforts in these areas. If accuracies are reduced to near-zero nonnuclear weapons on ballistic missiles may be possible. Although there are some low level studies examining this area, we have no ongoing Air Force Developmental efforts.

In summary, the Air Force has only the MaRV effort funded in fiscal year 1986. The technology being developed could support a late 1990s IOC, but is generic (applicable to all ballistic missile systems) until full scale development is initiated.

[Whereupon, at 5:04 p.m., the subcommittee adjourned, subject to the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1986

FRIDAY, MARCH 8, 1985

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

SEA-BASED DETERRENT

The subcommittee met in open session, pursuant to notice, at 10:27 a.m., in room SR-222, Russell Senate Office Building, Senator John W. Warner (chairman) presiding.

Present: Senators Warner, Exon and Levin.

Staff present: Robert F. Bott, William E. Hoehn, Jr., professional staff members, Russell C. Miller, research assistant and Karen A. Love, staff assistant.

Also present: Romie L. Brownlee, assistant to Senator Warner; Henry D. Sokolski, assistant to Senator Quayle; Allan Cameron, assistant to Senator Denton; Jeffrey B. Subko, assistant to Senator Exon; Peter D. Lennon, assistant to Senator Levin; and Phillip P. Upschulte, assistant to Senator Glenn.

OPENING STATEMENT BY SENATOR J. JAMES EXON, PRESIDING

Senator EXON [presiding]. Gentlemen, let's start. The chairman will be here in a few moments. We have been holding this up a long time, and I think we should just move ahead.

I have no opening statement other than to say we are delighted that you are here. We think the subject that we are going to be dealing with this morning is one of the key areas of defense for which the Strategic and Theater Nuclear Forces Subcommittee has oversight responsibility.

So I will ask you to proceed. I assume that Commodore Bacon will be the lead-off witness, but if any of you have any opening statements or opening comments, it would be in order at this time. I will allow you to proceed in any fashion that you feel appropriate.

STATEMENT OF COMMODORE ROGER F. BACON, U.S. NAVY, DIRECTOR, STRATEGIC AND THEATER NUCLEAR WARFARE DIVISION, OFFICE OF THE CHIEF OF NAVAL OPERATIONS, ACCOMPANIED BY REAR ADM. GLENWOOD CLARK, U.S. NAVY, DIRECTOR, STRATEGIC SYSTEMS PROGRAMS; REAR ADM. LAWRENCE LAYMAN, U.S. NAVY, DIRECTOR, NAVAL COMMUNICATIONS DIVISION, OFFICE OF THE CHIEF OF NAVAL OPERATIONS; REAR ADM. STEPHEN J. HOSTETTLER, U.S. NAVY, DIRECTOR, JOINT CRUISE MISSILES PROJECT; COMMODORE THEODORE E. LEWIN, U.S. NAVY, DIRECTOR, STRATEGIC SUBMARINE DIVISION, OFFICE OF THE CHIEF OF NAVAL OPERATIONS; AND DR. EDWARD Y. HARPER, TECHNICAL DIRECTOR, SSBN SECURITY PROGRAM

Commodore BACON. Yes, sir, Senator Exon. I am Commodore Roger Bacon, Director of the Strategic and Theater Nuclear Warfare Division in the Office of the Chief of Naval Operations. My purpose today is to update you on the status of the Navy's sea-based strategic deterrent and the Tomahawk nuclear cruise missile. We very much appreciate the opportunity to once again appear before this subcommittee and participate in your very important work.

Before proceeding, allow me to introduce the key people in the Navy Nuclear Missile Program: Rear Adm. Glenwood Clark, Director of Strategic Systems Programs; Rear Adm. Larry Layman, Director of the Naval Communications Division; Rear Adm. Steve Hostettler, Director of the Joint Cruise Missiles Project; and Commodore Ted Lewin, Director of the Strategic Submarine Division; and Dr. Edward Harper, the Technical Director of the SSBN Security Program.

Senator EXON. Commodore, let me just interrupt to say that we are in open session now. We would like to cover as much as possible in this open session, but I just wanted to make sure that we all understood the ground rules and that we will follow this with a closed session. We will follow the usual procedure of going into closed session somewhere after the open testimony that you care to give. If questions come up that you feel would be better answered in closed session, please do not hesitate to so indicate.

Commodore BACON. Yes, sir; we will so indicate. I have submitted a prepared statement for the record.

Senator EXON. Without objection, that will be accepted, you may go ahead.

Commodore BACON. I would briefly like to summarize that statement.

Senator EXON. Thank you.

Commodore BACON. Sir, submarine launched ballistic missiles provide survivable and enduring strategic forces. They are deployed at sea in undetectable strategic submarines, and these missiles are invulnerable to preemptive attack. SSBN's routinely remain at sea on patrol for periods of approximately 2 months with no external support. This combination of survivability and endurance ensures that we have credible means of retaliation and thus credible means of deterrence.

The President's Strategic Modernization Program includes strategic submarines and submarine launched ballistic missiles to enhance survivability and endurance to our future strategic triad. This Modernization Program assures the vitality of deterrence by clearly demonstrating to any state that it has much to lose and little to gain by initiating aggression against the United States and its allies.

Since last year's testimony, our fifth Trident submarine U.S.S. *Henry M. Jackson*, has been commissioned. Proudly named in honor of the late member of this committee, *Jackson* will commence her first deterrent patrol this coming summer. Also this summer, the sixth Trident, U.S.S. *Alabama,* will be commissioned. Deliveries of Trident submarines to the Navy are now averaging more than 6 weeks ahead of the scheduled contract delivery dates.

The Trident submarines are the most effective warships of their kind in the world today—quieter, faster and with more firepower than the aging SSBN's they replace. The first four Tridents, the U.S.S. *Ohio, Michigan, Florida* and *Georgia* have together successfully completed 18 deterrent patrols so far. They are operating out of their base in Bangor, WA. The Deputy Chief of Naval Operations for Submarine Warfare has characterized their performance as truly superb. The fiscal year 1986 budget requests authorization for the 13th and advance procurement for the 14th and 15th ships.

In addition to our Trident submarines, we currently have 31 older Poseidon SSBN's, built during a 6-year period in the 1960's. Nineteen are equipped with the Poseidon [C-3] missile and operate from bases in Charleston, SC, and Holy Loch, Scotland. The remaining 12 of these Poseidon SSBN's, operating from Kings Bay, GA, have been backfitted to carry the Trident I [C-4] missile. The Trident I [C-4] missile is also deployed on our operational Trident submarines in Washington. The overall reliability of the Trident I [C-4] missile has been excellent. Since August 1983, there has not been a single Trident I [C-4] missile failure in 26 consecutive operational test flights.

We plan to retain these 31 Poseidon ships in strategic service until the end of their nominal 30-year life in the 1990's unless required to retire some ships earlier due to arms control considerations. As you are aware, the President has stated that the United States will continue to refrain from actions that would undercut existing arms control agreements so long as the Soviets show equal restraint. If this policy remains in effect, we must continue to dismantle ballistic missile launchers—strategic submarines or ICBM silos—in order to remain within the SALT I and SALT II limits as modernized elements are added to the U.S. strategic force.

Specific dismantlement decisions are a very complex matter with political, military effectiveness, and fiscal considerations. A final decision on continued observance of the SALT limits has not yet been made. The President has directed that all of our programmatic and arms control options be maintained. Accordingly, we have planned and funded overhauls for the affected Poseidon submarines, and we have also protected the capability to dismantle them.

The Trident II [D-5] weapon system is now in its second year of full scale engineering development. Planned initial operational capability for the Trident II [D-5] is December 1989. The Trident II

Program is on track and within cost. The ninth Trident ship will be the first new construction ship equipped with the Trident II [D–5] capability as it is built in the shipyard. The first eight Trident submarines will be backfitted with the Trident II [D–5] weapon system during their first overhaul beginning in the early 1990's.

SURVIVAL OF STRATEGIC SUBMARINES

I stressed earlier the importance of the survivability of our strategic submarines. Maintaining that survivability in the face of ever-improving technology is essential. The SSBN Security Program is tasked to assure the continuing covert mobility of our SSBN's. The SSBN Security Program, with the best scientific support available in the country, continually studies technologies that could conceivably be relevant to the future survivability of the SSBN force. If a potential threat is identified, appropriate countermeasures and changes in operational procedures and tactics are used to negate that threat.

The SSBN Security Program provides assurance the Soviets have no foreseeable technological capability that could significantly diminish the strategic effectiveness of the United States SSBN force. This is not a static situation, however, and this vital security effort must continue.

TLAM/N

Turning now to the Tomahawk Nuclear Land Attack Missile, TLAM/N, I am very pleased to report that the scheduled initial operational capability of TLAM/N was achieved in June 1984 with its introduction into both the Atlantic and Pacific Fleets. TLAM/N deployments continue and will encompass 82 surface ships and 101 submarines by the mid-1990's. Our ability to distribute this significant deterrent firepower on a large number of submarines and surface ships remains the primary advantage of TLAM/N.

To broaden the industrial base for the Tomahawk system, the joint cruise missiles project awarded competitive contracts in December 1984 for the production of 300 Tomahawk all-up-rounds of all variants for fiscal year 1985. General Dynamics received 60 percent and McDonnell Douglas 40 percent of the fiscal year 1985 buy.

STRATEGIC C^3 MODERNIZATION PROGRAM

Finally, the President's Strategic Modernization Program gives top priority to strategic command, control and communications. The Navy recognizes and strongly supports the need for C^3 modernization to ensure that the strategic submarine force can respond to the National Command Authority.

To this end, the Navy is actively pursuing strategic C^3 modernization initiatives across the spectrum of requirements. The extremely low frequency communications system, ELF, protects SSBN survivability and increases our operational flexibility. The extremely high frequency satellite communications system, or Milstar, will provide worldwide essential communications for command and control of both strategic and tactical military forces through all projected threat environments. The Tacamo emergency

relay aircraft fleet and the equipments they carry are being modernized. We are also working jointly with DARPA to develop technology for submarine laser communications, and we are developing subsystems for survivable and enduring communications.

SEA BASED DETERRENT

In conclusion, the status of our sea-based deterrent remains good. Today, over 2,300 men are at sea deployed on our SSBN's on patrol. The capabilities of the strategic submarine force have continued to improve due to the strong support the Trident system and the other components of our sea-based deterrent have continually received from the Congress, and especially from this committee.

I most strongly urge you to continue your support for these vital programs.

Mr. Chairman, Admiral Hostettler has a few additional remarks on our cruise missile project.

[The prepared statement of Commodore Roger F. Bacon follows:]

PREPARED STATEMENT OF COMMODORE ROGER F. BACON, U.S. NAVY, DIRECTOR, STRATEGIC AND THEATER NUCLEAR WARFARE DIVISION, OFFICE OF THE CHIEF OF NAVAL OPERATIONS

Mr. Chairman, I am Commodore Roger Bacon, Director of the Strategic and Theater Nuclear Warfare Division in the Office of the Chief of Naval Operations. This division provides a focal point within the Navy to translate national nuclear policy into supporting Navy requirements, and to assess how well our current and future systems, plans, and policies support our national objectives. For the last 21 months, I have been Admiral Watkins' principal adivsor on all policy and planning matters involving nuclear weapons, including arms control issues. I appreciate the opportunity to appear before this important subcommittee again this year.

Before I discuss the particular details of our sea-based deterrent, I want to focus on why we have this force and what it contributes to our national security. The requirement for submarine launched ballistic missiles [SLBMs] stems from U.S. deterrent policy. This policy requires U.S. strategic forces to possess retaliatory capabilities which are, among other things, survivable and enduring.

SLBMs provide survivable and enduring strategic forces. Deployed at sea in undetectable strategic submarines [SSBNs], SLBMs are invulnerable to preemptive attack. SSBNs routinely remain at sea on patrol for periods of approximately two months with no external support. This combination of survivability and endurance ensures we have credible means of retaliation and thus credible means of deterrence. Additionally, as part of the strategic force triad, SLBMs complicate any defenses the Soviets may devise against strategic weapons. The ability of SLBMs to vary attack azimuths and to provide a secure reserve force are great complications for Soviet defenses.

SLBM characteristics of survivability and endurance also contribute to stability. Since our SSBNs cannot be attacked successfully, no enemy is likely to initiate aggression when his attack cannot deny our capability to retaliate effectively. The President's strategic modernization program includes SSBN and SLBM modernization to enhance survivability and endurance to our future strategic triad, and thereby assure the vitality of deterrence by clearly demonstrating to any state that it has much to lose and little to gain by initiating aggression against the U.S. and its allies.

Since last year's testimony our fifth Trident submarine has been commissioned—USS *Henry M. Jackson*, in October 1984. The *Henry M. Jackson*, proudly named in honor of the late member of this committee, will commence her first deterrent patrol this summer, shortly after the sixth Trident, USS *Alabama* is commissioned. Deliveries of Trident submarines to the Navy are now averaging more than six weeks ahead of the contract delivery dates established in August 1981. The first four Tridents, USS *Ohio, Michigan, Florida*, and *Georgia*, have together successfully completed eighteen deterrent patrols operating out of their base in Bangor, Washington.

The Trident submarines are the most effective warships of their kind in the world today—quieter, faster, and with more firepower than the aging SSBNs they replace.

The Deputy Chief of Naval Operations for Submarine Warfare has characterized their performance on patrol as "truly superb." The fiscal year 1986 budget requests authorization for the thirteenth and advance procurement for the fourteenth and fifteenth ships. We plan to procure one Trident per year, to support an all Trident force of about twenty ships by the end of the century. The ultimate number of Tridents to be built has not yet been determined.

In addition to our Trident submarines, we currently have thirty-one older SSBNs, built during a six year period in the 1960's. Nineteen are equipped with the Poseidon (C-3) missile and operate from bases in Charleston, South Carolina, and Holy Loch, Scotland. The remaining twelve of these SSBNs, operating from Kings Bay, Georgia, have been backfitted to carry the Trident I (C-4), which is also deployed on our operational Trident submarines. The overall reliability of the C-4 missile has been excellent. Since August 1983 there has not been a single missile failure in twenty-six consecutive operational test flights.

We plan to retain these thirty-one Poseidon ships in strategic service until the end of their nominal 30 year life in the 1990s unless required to retire some ships earlier due to arms control considerations. As you are aware, the President has stated that the U.S. will continue to refrain from actions that would undercut existing arms control agreements, so long as the Soviets show equal restraint. If this policy remains in effect, we must continue to dismantle ballistic missile launchers (strategic submarines or ICBM silos) in order to remain within the SALT I and II limits as new elements are added to the U.S. strategic force in accordance with the President's strategic modernization program. Specific dismantlement decisions are a complex matter with important political, military effectiveness, and fiscal considerations. A final decision on continued observance of the SALT limits has not yet been made. The President has directed that all of our programmatic and arms control options be maintained. Accordingly, although we have planned and funded overhauls for the affected Poseidon submarines, we have also protected the option to dismantle them if required.

The Trident II (D-5) weapon system is now in its second year of full scale engineering development, with a planned initial operational capability [IOC] in December 1989. The Trident II program is on track and within cost. Eventually, all Trident submarines will be configured to carry the Trident II missile. The ninth Trident ship will be the first new construction ship equipped with the Trident II missile. The ninth Trident Ship will be the first new construction ship equipped with the Trident II capability as it is built in the shipyard. The first eight Trident submarines will be backfitted with the Trident II weapon system during their first overhaul beginning in the early 1990s. The possibility of accelerating the Trident II weapon system has been questioned periodically, but it is no longer possible to accelerate its IOC. We could, however, increase the Trident II deployment rate above what we presently plan by accelerating some backfits of Trident II into the first eight Trident submarines. Such an acceleration is not required at the present time, but the option is available should national requirements change in the future.

I stressed earlier the importance of the survivability of our strategic submarines. Maintaining that survivability in the face of ever improving technology is essential to our strategic posture and national defense. It is the objective of the SSBN security program to assure the continuing covert mobility of our SSBNs, required in the fulfillment of their mission of strategic deterrence. The SSBN security program, with the best scientific support available in the country, is dedicated to keeping our SSBNs survivable by anticipating possible threats and developing appropriate responses. It continually studies technologies that could conceivably be relevant to the future survivability of the SSBN force. This is a dynamic and continuing process as technology changes, and we maintain an appropriate skepticism as we search for potential scientific breakthroughs. Detailed assessments are conducted using rigorous scientific data, experiments, mathematical models, real world tests, and all-source intelligence. If a potential threat is identified, appropriate countermeasures and changes in operational procedures and tactics are used to negate that threat.

The result of this program's efforts to date is factual and authoritative assurance that there is no foreseeable technological capability by which the Soviet's could significantly diminish the strategic effectiveness of the U.S. SSBN force. This is not a static situation, however, and this vital effort must continue to resolve uncertainties as technology develops. The SSBN security program deserves your strongest support; it is one of the most important elements within Navy research and development.

As I reported last year, the Tomahawk cruise missile system was ready for production in support of the President's program. His program announced the deployment of the Tomahawk nuclear land attack cruise missile [TLAM/N] to begin last

summer. I am pleased to inform you that the scheduled operational status was achieved aboard surface ships and submarines in June 1984 with the introduction of TLAM/N into both the Atlantic and Pacific fleets.

The deployment continues and will eventually encompass 82 surface ships and 101 submarines by the mid-1990s. Our ability to distribute this significant deterrent firepower through the deployment of TLAM/N on a large number of existing and programmed Navy submarines and surface ships remains the primary advantage of TLAM/N. The rationale for this tremendously capable weapon system has not changed since I last spoke with you.

Why does the Navy need Tomahawk? First, the Tomahawk nuclear SLCM enhances deterrence by augmenting the U.S. nuclear reserve force—that part of the force which could be withheld to deter follow-on attacks against the U.S. or its allies.

Second, it provides a survivable, global nonstrategic nuclear capability which enhances deterrence by denying the Soviets any reasonable hope of preemptively destroying U.S. sea-based non-strategic nuclear forces. Heretofore, only carriers have been able to provide non-strategic nuclear options where nuclear weapons are not stationed ashore. TLAM/N supports this existing mission requirement both by reducing the possibility that attacks against the carriers could preempt world-wide options, and by providing an on-scene nuclear deterrent in the absence of carriers. In a land attack role, the combination of carrier aircraft and TLAM/N significantly improves the carrier battle group's flexibility and effectiveness. It will also provide an increase in the range of escalation control options available to the National Command Authority [NCA].

Third, this missile provides a key deterrent to Soviet plans to use nuclear antiship missiles aboard Soviet naval aviation Backfires and Badgers to attack our naval combatants, especially our aircraft carriers. SNA Backfires and Badgers regularly train and plan for such missions. By removing any Soviet perceptions that Soviet naval aviation could initiate nuclear war at sea, unharmed, from land-based sanctuaries, TLAM/N makes it clear that nuclear strikes against the U.S. Navy could have widespread consequences. It thereby increases our ability to deter such attacks.

In last year's testimony I indicated to you that the transfer of technology between the airframe contractor and the guidance contractor was continuing, and both companies would be ready to compete for the fiscal year 1985 buy of the Tomahawk all-up-round.

I am pleased to report that the joint cruise missiles project has maintained the commitment to broadening the industrial base and competitive contracts were awarded in December 1984 for the production of 300 Tomahawk all-up-rounds for fiscal year 1985. General Dynamics received 60 percent and McDonnell Douglas 40 percent of the fiscal year 1985 buy.

The Navy remains committed to the dual source program for the following compelling reasons: (1) maintaining a geographically dispersed production and maintenance base for Tomahawk missiles will avoid financial and strategic risks of disruption or delay and ensure a mobilization surge capacity for the future; (2) maintaining a competitive procurement environment can result in lower cost, improved quality, and increased delivery schedule protection; and finally (3) establishing two competing depot operations at General Dynamics and McDonnell Douglas can minimize costs for Tomahawk maintenance support.

The President's strategic modernization program gives top priority to strategic command, control, and communications. The Navy recognizes and strongly supports the need for C^3 modernization to ensure that the strategic submarine force is responsive to the needs of the national command authority.

To this end, the Navy is actively pursuing strategic modernization initiatives across the spectrum of requirements. The Extremely Low Frequency [ELF] communications system enhances the credibility of our sea-based deterrent forces by protecting their assured survivability and increasing operational flexibility. The Extremely High Frequency [EHF] military strategic tactical and relay (MILSTAR) satellite communications system will provide worlwide essential communications for command and control of both strategic and tactical military forces through all projected threat environments. We are also investing in research and development for submarine laser communications, investigating techniques for survivable and enduring communications, and upgrading the equipments carried on the Tacamo fleet.

Tacamo is the Navy's airborne relay communications system dedicated to providing connectivity between national command authority and the strategic submarine force in the trans- and post-attack period. A key component in our plans for strategic C^3 modernization is the replacement of the aging and slow EC-130 aircraft with

a modern aircraft fleet capable of maintaining a continuous on-station posture and connectivity with Trident submarines throughout their operating areas. E-6A, with its increased range, speed, endurance, growth potential, airborne refueling, and survivability, meets current and future Tacamo requirements.

In conclusion, the status of our sea-based deterrent remains good. The overall Navy program successfully avoids any imbalance between the needs of our strategic and general purpose forces. Should Future national requirements dictate, the Navy's strategic program could be expanded, but no expansion or acceleration could have any impact before the early 1990's. I do not recommend that we undertake any such expansion or acceleration now. Planned introduction rates for the Trident submarine, the Trident II (D-5) missle, and strategic C^3 enhancements will meet our future needs as I perceive them. The strategic submarine force will continue to perform its vital mission.

As Admiral Watkins testified before the full Armed Services Committee last month, our survivable submarine ballistic missile force is increasing in importance to nuclear deterrence, the cornerstone of national security policy. That the capabilities of the force have continued to grow commensurate with its importance is due in large measure to the strong support Trident and the other components of our sea-based deterrent have consistently received from the Congress and especially from this committee. I urge you to continue your support for these vital programs.

Thank you.

Senator WARNER [presiding]. First, I extend my apologies to my colleague, the former distinguished ranking minority member, and others. We had a very extensive meeting with the President this morning. I am a member of the group of Senators that will be going to Geneva tomorrow morning, and we met with the President, Secretary of State and the three negotiators and had an extensive discussion.

I beg the forgiveness of all.

Good morning, Admiral Hostettler.

Admiral HOSTETTLER. Good morning, sir.

Mr. Chairman, Senator, I am Rear Adm. Steve Hostettler, Director of the Joint Cruise Missiles Project Office, and I am pleased to have again the opportunity to come before you to discuss briefly the status of the Tomahawk Weapon System Program as I see it today.

I will focus on three main areas: Recent program improvements, the status of our competitive production plan, and major milestones that have just been achieved or are about to be achieved in the very near future.

PROGRAM IMPROVEMENTS

In the area of program improvements, we have continued to make changes in our production operations to improve throughput and increase first pass yield rates as well as provide overall improvements in quality.

As for our competitive production aspects of the All-Up-Round or the total missile, you may recall that I did report to you at this time last year that the risk appeared to me to be too great technically to award a fully competitive contract at that time. In the ensuing period, in the past year, we have completed our formal and successful testing of the All-Up-Round at General Dynamics, airframe as well as guidance, and at McDonnell Douglas in Titusville, FL, in the same way. This testing and extensive reviews at both of those prime contractors and their vendors have increased our technical confidence to such a point that I believed it was prudent and

proper that we make our first full competitive award of those missiles in fiscal year 1985.

Accordingly, we signed such a contract in December of last year, and as indicated by Commodore Bacon, General Dynamics was the winner, with 60 percent of the buy, with McDonnell Douglas in their first year getting 40 percent of the buy.

We do have an option in that contract for 30 conventional land attack Tomahawk cruise missiles that we hope to pick up this spring.

I would also like to add at this time that the actions by both McDonnell Douglas Astronautics Co. and General Dynamics, Convair Division in San Diego, are in a competitive spirit, or else we could not have made it. The two companies offered proposals that clearly indicate to me that we will be in a position in the future to control costs and maintain high quality manufacturing capability for increased Tomahawk production in the years to come.

Since I last talked to the committee, we have made substantial progress, I believe, in fulfilling our commitment to our operating forces. During the past year we have deployed the ground-launched cruise missile in Comiso, Italy, and activated additional flights at Greenham Common in the United Kingdom. The next major ground-launched Tomahawk milestone is activation of the first flight at Florennes Air Base, Belgium. Construction of those base facilities has commenced, and we have started delivery of certain support equipment.

As I also stated last year, we are on schedule to achieve initial operational capability of the nuclear land attack missile on both submarines and surface ships, as well as meeting the initial operational capabilities of the antiship variants of the Tomahawk on surface ships. All of these major milestones were achieved on schedule in June of last year.

The Submarine Program, as indicated by Commodore Bacon, continues on schedule. We have certified 12 Tomahawk capable SSN-688 *Los Angeles* class submarines with 9 more planned this calendar year. To support the submarine deployment with Tomahawk, four submarine tenders and two shore facilities, one in Yorktown, VA, and the other in New London, CT, have been upgraded to fully support these submarines. Highlights for the future will be the attainment of the submarine vertical launch capability. Initial operational capability for this system is planned for 1987. This system will be in all new designed 688 class submarines and will allow for the installation of 12 additional Tomahawk's without removing a single torpedo.

The surface ship launched Tomahawk Program remains on schedule as well. In April of last year, Tomahawk installation was completed on our second battleship, the U.S.S. *Iowa*, approximately 3 months ahead of schedule.

The first battleship, U.S.S. *New Jersey*, which was loaded with Tomahawks initially in March 1983, and subsequently deployed to both the Pacific and the Mediterranean, has since returned providing us with extremely valuable captive carry Tomahawk missiles and armored box launcher data. The missiles have been offloaded and are currently undergoing analysis at contractor facilities. In

addition, the *New Jersey* has been brought up to the latest Tomahawk weapon system baseline.

VERTICAL LAUNCH SYSTEM

A major milestone in the Tomahawk Surface Ship Program yet to achieved is the vertical launch system in surface ships. The first actual ship launch of the Tomahawk from the vertical launch system on board ship is scheduled for the third quarter of 1985, with operational evaluation in late 1985 and deployment set and remains set for 1986.

In concluding my statement to this committee today, I would like to point out that we now have this significant weapon system in a deployed status. We have tested all of the variants in the operational environment, and we know that they work and work well. The competition we have just recently entered into for the All-Up-Round missiles will keep the cost down and the quality up I believe for years to come.

As a result of Tomahawk deployment through the mid-1990's, the U.S. Navy will increase its offensive capability from 14 ships to more than 180 ships in a most effective manner while diluting the striking power of our potential enemy.

The primary purpose of our Navy is to keep the sea lanes of communication open to the free world. The continued deployment of Tomahawk will assist in maintaining this commitment.

Thank you, Mr. Chairman.

Senator WARNER. That's a good report. Thank you, Admiral.

The Chair is anxious to proceed into executive session, but Mr. Exon, do you have some questions?

Senator EXON. Thank you, Mr. Chairman.

Commodore Bacon, you indicated—and I strongly agree—that in our missile submarines we have an invulnerable force out there today.

Under present intelligence information, how far in the future do you see that force could be described safely invulnerable?

Commodore BACON. Senator, I feel that the force is invulnerable at least to the turn of the century. Our intelligence estimates, however, use about a 10-year period because we cannot look far enough into the future to actually see technology changes. So the answer to your question would be that the invulnerability of your credible deterrent force will extend at least another decade.

Senator EXON. Thank you for your straightforward answer. Those are the kinds of answers that we appreciate very much.

STRATEGIC DETERRENCE

I will try to keep my questions short so I will not be making a speech, but let me see if I can set this next question up with regard to the whole strategic deterrence. All too often we tend to isolate the legs of the triad and as you know, there is a battle waging now on the MX Missile Program. The focus of the attention is basically on the vulnerability of the MX missiles, and just so that I will not mislead any of you, if you do not know my feelings on the MX missile, you should know that although the Strategic Air Command headquarters is in my State of Omaha, Nebraska, I happen to feel

that the MX missile has been overplayed and is tremendously expensive for the value of deterrent that we would gain from it.

But that is a personal opinion, and not everyone agrees with that.

One of the things that has been covered in both closed and open session has been the D–5 missile. Now, if we are going to live up to the unratified SALT agreements we will have to eliminate some of our older missiles as newer ones are fielded. As you know, we have been dismantling Titan's among other reasons, to get down to an overall number of missiles that will allow us to deploy our more modern systems.

I have taken some exception to that from the standpoint that originally we had planned not to take out the Titan's until the MX would take its place. I think we have been somewhat premature in phasing out the Titan's.

I do not wish to get into a discussion on the Titan's, but I would say that there is some degree of confusion, I think, over how fast we have to dismantle the Titan force to allow the Navy to proceed as you have outlined here this morning.

How serious a problem do you think that is, and do you agree with the general thesis of what I have been saying—that is, that we must phase out the Titans to give you some room to live within the SALT limitations?

Commodore BACON. I agree with the premise that Titan missile launchers would be adequate for compensation up through the sea trials of our sixth SSBN, U.S.S. *Alabama*. With the sea trials of the seventh Trident, U.S.S. *Alaska*, in September of this year we will approach not only the 710 limit on sea-launched ballistic missile and Titan but also the se thinkSALT II limit on MIRVed missile launchers, which includes Minuteman III, Poseidon, and Trident missiles. And here are the hard decisions which will have to be made by national authorities—whether we will continue in the no-undercut mode, and how to compensate for the seventh Trident SSBN.

Senator EXON. Thank you.

One last question, Mr. Chairman, as far as this round is concerned for me. I just want to ask you a general question.

BATTLESHIP REACTIVATION

As you know, the Navy is requesting the fourth battleship, the *Wisconsin*, in the budget. If for any reason that fourth battleship was not reactivated, programmed, and planned, would that have any deteriorating effect, in your opinion, on the strategic and theater nuclear forces operation of the Navy?

Commodore BACON. I do not believe that it would change in the strategic sense—with regard to strategic forces. In the theater nuclear area, that battleship would eventually be programmed to have our deterrent force of TLAM/N's, along with conventional Tomahawks and other weapons systems.

Senator EXON. In other words, it is a platform?

Commodore BACON. It is a platform, just like the great ship U.S.S. *New Jersey*, which traveled from the Pacific to the Mediterranean to respond to crises. I believe that our battleships have a

great role to play in complementing our carrier battle groups, and add significantly to our firepower in the Navy.

Senator EXON. I agree with you. It just seems to me, though, that an invulnerable force that cannot be located by the Soviets is a far greater deterrent than battleships that are easily located by the enemy. I recognize that battleships provide a platform, but they are hardly an invulnerable platform as compared with a submarine.

Is that sound naval logic?

Commodore BACON. Yes, sir.

Senator EXON. Thank you, Mr. Chairman.

Senator WARNER. Well, putting in a patched plug for the old battleship, you have to remember that we face a lot of contingencies other than possible threats by the Soviet Union. Military operations where naval gunfire is needed for support troops, particularly the Marines who would have to go in. I think that is one of the major justifications. We had better not lower the 16-inch guns at each other this morning.

Senator EXON. Mr. Chairman, I just wanted to say that I asked the question carefully framed in the context of strategic and theater nuclear forces, and I agree with you that this is probably not the time to start talking about the battleships and whether they scare the Soviets or not.

Senator WARNER. I will ask a few questions, and then you can ask a few, Mr. Levin.

TRIDENT II

Some are arguing as to the kind of capabilities planned for the Trident II because it would constitute a so-called first strike capability, Commodore Bacon. Would you share your views with us about our first strike capabilities and indicate how Trident II would or would not constitute such a capability.

I answered yesterday in extensive news coverage that I did not feel that bringing in Trident II, even coupled with MX, supplied this country with a first strike capability. But I think a wise point to start this discussion would be, first, your understanding of what first strike means and how that term is used.

Commodore BACON. Mr. Chairman, my understanding of the term "first strike capability" is that it is the ability to deliver in a preemptive first strike an attack so devastating that the enemy's offensive nuclear capability to retaliate would not cause unacceptable damage to the United States.

Senator WARNER. That is the one that I used.

Commodore BACON. And on that premise I believe that the best answer comes from the President through the Secretary of Defense in the Secretary of Defense's report to Congress this year. I would like to articulate specifically what he wrote.

> The President has said on numerous occasions, a nuclear war cannot be won and must never be fought. Even a cursory glance at our nuclear force structure and modernization plans makes clear that this is in fact our policy. We do not have, nor do we seek a first strike capability.

I would like to make several further points. No U.S. first strike could ever prevent an unacceptable Soviet retaliation from their

SSBN's at sea—SSBN's on patrol today. Similarly, the Soviets could retaliate with their massive land-based ballistic missile forces. In the last 10 years they have fielded heavy ICBM'S—SS-18's and SS-19's—alone. Any first strike would be detected, and the Soviets could launch, upon detection of an incoming United States attack.

I mentioned that the first priority of our strategic modernization program is to develop survivable and enduring command and control systems—at great expense, as you are well aware. We would not have that priority or the emphasis in communications modernization on survivability if the U.S. policy was ever to try to develop a first strike capability.

Senator WARNER. I think in approaching an analysis to this question you have got to take cognizance of the statements made by this President, and indeed every President preceeding him, and I am confident every President that will come after. Nevertheless, you have to place yourself in the shoes of a Soviet planner, a person comparable to yourself who gives advice to the Soviet Politburo.

And as I look at it from a cold, analytical standpoint, by taking the composite of the combined forces of Trident II and a full 100 MX's in silos, if used in a preemptive mode, a Soviet planner would have to inform his superiors that even that massive force would not be sufficient to constitute a first strike as we have defined it, and thereby render ineffective Soviet retaliatory force.

Commodore BACON. Yes, sir.

PROMPT RETALIATORY CAPABILITY

Senator WARNER. I think we have covered that one adequately.

Now, prompt response capability. A number of witnesses who have appeared before this committee recently have testified that the SSBN force does not and will not provide a prompt retaliatory capability because of the timeliness of reliable communication. This would seem to have particular relevance to the capabilities that are planned for Trident II.

Would you comment on this?

Commodore BACON. In my view, time urgent targets are those whose value decays with some amount of time. From the perspective of time on target, SLBM's, or submarine-launched ballistic missiles, are really as capable of handling time urgent targets as any system that we have. In case of targets whose value decays very rapidly, such as the Soviet missiles, no United States strategic system can arrive on target in sufficient time to negate a Soviet ICBM attack.

All United States ballistic missiles, both ICBM's and SLBM's, can arrive before any Soviet follow-on attack, or reloads, or reconstitution, or use of their reserve forces. And thus, the difference between the arrival time of our force is not militarily significant. Nevertheless, the time urgency debate continues on. The real purpose of the entire triad is deterrent of which time urgency is just one factor.

Senator WARNER. Of course we recognize our land system is more prompt in terms of response from a Presidential directive

than is the submarine forces. There is a built-in delay because of certain unique communications that are necessary for the submarine force. But nevertheless, it is a very essential element of the triad component.

Commodore Bacon, this year finds the first major procurement for the E-6A replacement for TACAMO. Can you provide this committee with information regarding the extent to which the Trident SSBN operations are or will be limited by communications considerations, and indicate how our program improvements, and especially the E-6A, will change this situation.

Commodore BACON. Mr. Chairman, I would like to ask Admiral Layman to address that question, with your permission.

Admiral LAYMAN. Good morning, Mr. Chairman.

At the present time we have a limited number of Trident submarines at sea.

Senator WARNER. You might give the exact number of what are operational today.

Admiral LAYMAN. We have four today.

Senator WARNER. And the fifth is due to come in on an operational status?

Admiral LAYMAN. This summer.

For the open session I would like to limit my remarks to saying that presently we can serve the force adequately. As the force grows we need larger operating areas, and therefore, we need an enhanced command and control capability. And I would suggest, Mr. Chairman, perhaps we could discuss this more fully in closed session.

Senator WARNER. Right. But I do want to have in open session a clear endorsement by this group of witnesses—and I presume you will give it—for the E-6A Program, the necessity for that to enhance the full range capabilities of the Trident system.

Admiral LAYMAN. Yes, sir; I can give that endorsement. In order to operate the Trident force in the planned operating area, you need an aircraft relay platform with the range and distance and speed capabilities that is in the E-6 and is not present and inherently available in the EC-130. And therefore, particularly in a stressed environment, to provide the needed strategic connectivity to the full operating area, an aircraft must operate at a distance sufficiently far from the United States that only the E-6A can provide that capability.

Senator WARNER. That is fine.

Now, Senator Levin.

Senator LEVIN. Thank you, Mr. Chairman.

SALT II

First, on a subject which Senator Exon asked, and that is the Salt II question. You have indicated that decision will be made by the President, presumably at some point later. Have you made a recommendation on whether we ought to continue a no-undercut policy to the President or to anyone in the Department?

Commodore BACON. Senator Levin, no, we have not made a recommendation on that national policy.

Senator LEVIN. Do you have a personal feeling as to whether we should continue a no-undercut policy?

Commodore BACON. My personal feeling is that if we continue into 1986 the Salt II limits, even though this unratified treaty was due to expire in December of this year, it will be very painful—militarily significant—to continue dismantlement of various systems.

Senator LEVIN. Have you reached a personal conclusion as to whether we should?

Commodore BACON. No, I have not.

Senator LEVIN. I asked you a number of questions last year to which you gave me affirmative answers which are always helpful around here to have them straightforward, and you were very straightforward last year, and I am going to ask the same questions this year. The chairman will immediately think that I am asking about the ELF connection, but there is actually a broader concern that I am asking about, and here goes with the same questions that I asked you last year.

Senator WARNER. Well, he will give you the same answers.

Senator LEVIN. I want to alert you as to what they are.

Commodore BACON. Well, if anything has changed, we will review them again.

Senator LEVIN. Well, I would be delighted if nothing has changed.

Senator WARNER. You know, Senator, I want to cut the ribbon on that program. We started it in 1969. Will you join me?

Senator LEVIN. Yes, if you cut it here. [Laughter.]

SECURITY OF SEA-BASED NUCLEAR SUBMARINES

These questions relate to the security of our sea-based retaliatory nuclear subs and their deterrent value. We have to see just how secure our triad is. And again, these are much broader policy considerations than just the question of whether we need a new communications system or not. So here goes with the same question.

Would you agree with this statement again this year? Neither intelligence estimates nor U.S. development work in ASW indicates any dramatic advance or imminent breakthrough either by acoustic or other means of detection?

Commodore BACON. I continue to agree with that statement at the present time.

Senator LEVIN. Would you agree with this one this year: Nothing is known that would give credence to any assumptions that SSBN's at sea determined to avoid detection could be localized and destroyed with any confidence at all?

Commodore BACON. I agree with that statement. In fact, with our increasing numbers of Trident submarines, which are quieter, much better equipped to detect any threat, and operate in much larger areas, our survivability is being increased.

Senator LEVIN. Thank you.

SSBN FORCE ESSENTIALLY INVULNERABLE

How about this statement. A broad range of recent analyses are unanimous in their views that the SSBN force is essentially invulnerable today and will remain so for the foreseeable future?

Commodore BACON. I agree with that.

Senator LEVIN. And: Detection of floating wire antennas or communications buoys do not represent a serious threat to the U.S. SSBN force today.

Commodore BACON. Today they do not. I would ask Dr. Harper, the head of the SSBN Security Program, to comment on any changes during the last year on detection of those near surface antennas.

Dr. HARPER. I would like to respond in a general way now and then in a more specific way in closed session.

Today I would have no concern about detectability of antennas, either floating wire antenna or buoy, but from the research we are doing, I think it is clear to me 10 years from now we are probably going to have to patrol much deeper than we do today.

The concern is not airborne or aircraft systems. They probably cannot pose a forcewide threat to the submarines because of the large patrol areas, but the potential for satellite system detections posing a forcewide threat is a concern I think we have to think about if a breakthrough were made in detection technology. I have to tell you today that there is no imminent breakthrough on the horizon. That breakthrough would have to involve the development of a nonacoustic sensor with a high probability of detection at a very low false alarm rate.

It is almost certain, however, that if such a breakthrough were made, that sensor would be counterable by patrolling deeper and slower. And the ELF communication system offers insurance against such a breakthrough by allowing submarines to patrol at deeper depth.

Senator LEVIN. Do we know that they have spent a great deal of money in trying to develop that kind of detection? Do we have evidence that the Soviets have spent a good deal of money without success so far?

Dr. HARPER. Yes, sir.

Commodore BACON. We know that they have spent quite a bit, and more details will be available in the closed session.

Senator LEVIN. But so far without success? We can say that in open session.

Commodore BACON. Yes, sir.

SOVIET ABILITY TO DETECT U.S. SUBMARINES

Senator LEVIN. Now, there was a story—there were a number of reports in the press, the Washingon Times of August 16 and August 14, the Baltimore paper, that the Soviets already have operational a capability to detect United States missile submarines by radar-equipped satellites.

Now, that was denied by the Defense Department in those press reports. Do you have any comment on that?

Commodore BACON. I would ask Commodore Lewin.

Commodore LEWIN. Senator, I would verify what the Department of Defense stated publicly. We are prepared in closed session to give you some more precise details of our understanding of synthetic aperture radars and what the Soviets are doing.

Senator LEVIN. Talking about press reports, there were a number of press reports, including an article, I believe, in Parade Magazine, that a ballistic missile submarine captain, with the cooperation of one other person, can order the launch of his boat's missiles, and thus, that two people well below the President can fire nuclear weapons from a sub.

What is your public position on those reports?

Commodore LEWIN. Senator, the article is not accurate. There is a requirement that multiple people on board that ship, essentially the entire crew, must execute their responsibilities once a valid launch order has been received from the President before those missiles could or would be launched. There is no possibility that the commanding officer and one other person individually could do that job.

Senator LEVIN. Can a launch take place without the President's permission?

Commodore LEWIN. No, sir.

Senator LEVIN. Technologically it's impossible?

Commodore LEWIN. Procedurally it is impossible, sir.

Senator LEVIN. How about technologically. Is it impossible?

Commodore LEWIN. It would take the connivance of the entire crew to do such a thing.

Senator LEVIN. In other words, technologically it is possible, but——

Commodore LEWIN. We have completed over 2,300 strategic deterrent patrols. We examined the people very closely——

Senator LEVIN. I understand. But there is no link that is required to be set into motion by the President. It is conceivable technologically, although not practically, that such a launch could take place.

Commodore LEWIN. No launch—none of our commanding officers or our people would ever tell you that they would launch without the President's permission.

Senator LEVIN. I understand that, but that is still not my question. When it comes to land-based missiles and to missiles from planes, warheads from planes, it requires technologically a Presidential input. That is not true on subs.

Commodore LEWIN. In the planes, as I understand it, Senator—and I am certainly not an expert in that area—but there are varying degrees and varying times in the operational sequence when such a case is appropriate. It depends upon the weapons system, the platform and so forth.

In the Navy we have routinely and continually reviewed all those options to ensure the most reliable and safe system and one that will be executed only on the appropriate direction of the National Command Authority; and we consider that our system is fully satisfactory, sir.

Senator LEVIN. I do not doubt that. I still think we ought to have a clear answer on the record, and indeed everybody may agree that it is totally adequate. My point, however, is that when it comes to

subs, there is no technological requirement right in the machinery that there be a Presidential unlock.

Commodore LEWIN. That is correct, sir.

Senator LEVIN. Now, I do not know if I have more time. Assuming I do, I will ask one more question.

Senator WARNER. We are trying to be flexible, Senator.

FIRST STRIKE CAPABILITY

Senator LEVIN. On the first strike question, that we do not have first strike either policy or capability because the Soviets could retaliate after such a strike with unacceptable damage to us, and you particularly pointed to their subs. Is that also true of the Soviets, that if they struck us now, that we could respond with unacceptable damage to them, with devastating damage to them?

Commodore BACON. It is true that we could respond with devastating damage.

Senator LEVIN. Overwhelming damage to them?

Commodre BACON. In my view, yes.

Senator LEVIN. So that by our definition of first strike, they do not have first strike capability either.

Commodore BACON. That is the essence of deterrence.

Senator LEVIN. So by our definition of first strike, neither side has first strike capability now.

Commodore BACON. I think I would have to go back to the Nation's policy of not seeking to develop a first strike capability. Nor do we have one now.

Senator LEVIN. I am talking about right now, by our definition neither side has first strike capability now.

Commodore BACON. For the Soviets, you have to know the policy of the leadership of the country to answer that question.

Senator LEVIN. We do not have first strike capability, right?

Commodore BACON. Not under the definition that I gave previously.

Senator LEVIN. And by your definition do they presently have first strike capability?

Commodore BACON. They have an awesome strategic capability which their national leadership might perceive to be a first strike capability.

Senator LEVIN. And we have the capability to retaliate with awesome force, and by your definition——

Commodore BACON To retaliate, yes.

Senator LEVIN. With awesome force?

Commodore BACON. I think so, sir.

Senator LEVIN. So by your definition of first strike, they do not have first strike capability at this point, is that not true?

Commodore BACON. I believe it to be true, that the Soviets do not have a first strike capability, but what is important, is that they believe it to be true.

Senator LEVIN. Should I continue?

Senator WARNER. No.

Senator LEVIN. Well, let me quit.

Senator WARNER. Senator Exon?

Senator EXON. Let me follow up on a question. I think I will direct it to you, Commodore Lewin. You know, I think it may be difficult for you military people to sometimes understand the fears and concerns that average Americans have because, you know, by your excellent training and experience, that there is no way an accident can happen under a rational set of circumstances.

I guess, though, that many Americans fear a Captain Queeg scenario on a submarine or other launch platform where the commanding officer becomes irrational. Perhaps he becomes convinced in his own mind that he has received instructions from the President of the United States or higher command authority, and for the salvation of America he has to surface and start throwing nuclear weapons around. That is an ingrained fear among Americans and many other people in the world. In short, many fear what happens if the fail-safe mechanisms do not work.

Can you allay those fears here this morning in open session as to why a crazy Captain Queeg could not and would not be able to convince his crew that indeed he had received orders, and that the crew would be exercising their duties assuming they are carrying out orders from the National Command Authority?

Commodore LEWIN. I would hope I would be able to alleviate that concern, Senator, and I understand that concern. I think all of us do. I think we understand the concerns of the actual required use of nuclear weapons or the inadvertent use because of our day-to-day dealings with those very potent weapons.

Commodore Bacon and I have served many years at sea on the strategic missile submarines, and we are familiar with the procedures that we have used. As commanding officers, we did not have the capability to exercise that crew in firing the missiles by ourselves without the proper and full certification by at least two other officers of the precise validity of the orders of the National Command Authority. And then the crew, including those directly involved in exercising and making ready missile and launcher and fire control systems, had to be informed by both the commanding officer and the executive officer publicly over announcing or telephone systems that authority had been verified by them, as well as the other officer teams that were responsible for that verification.

We knew as commanding officers that we did not have that capability. Our crew knew that. We exercised those procedures in an exercise environment to ensure that we knew how to operate the system and to make it work and we were examined routinely. We have a Personnel Reliability Program which examines each of our performances to determine reliability, and the fact that we aren't decaying in our personal behavior such that we cannot responsibly execute the responsibilities that have been given to each and every crew member of that ship.

Senator EXON. Commodore, thank you. I am just going to pursue this one step further, because I think there are a lot of people who would like to ask these questions of people like you.

You and Commodore Bacon are not Captain Queegs, and that is reassuring. But how do you receive the command authority to launch and how many people have to hear that order through whatever communications sources you use to order a surfacing and firing?

Commodore LEWIN. Sir, we do not have to surface to fire these missiles. I would like to put that in context.

Senator EXON. You can surface and fire.

Commodore LEWIN. But we are not required to, and we routinely do not surface and fire.

Senator EXON. OK. Fire from down deep.

Commodore LEWIN. The message is received, initiated by the National Command Authority, which would be received by one of any multiple communications paths. The message must meet a precise format.

Senator EXON. To simplify the procedure, can you describe obvious means that would provide an order and how would it be relayed? Who hears it? What is the procedure?

Commodore LEWIN. The message, and without going into details that would be classified at this time, sir, could be from the Tacamo aircraft that Admiral Layman described. That message is received on one or more of submarine deployed antennas. It is received by a radio receiver in the radio room of the strategic submarine where there are always two or more radiomen trained in recognizing the type of message that would be received.

That radioman would routinely alert his commanding officer through the officer of the deck, the officer in charge of operating the submarine on a particular watch. The entire crew would then be alerted that a message from the National Command Authority has been received. Those people responsible then for validating both the format and the content to determine that a proper message has been received would proceed to the radioroom, so that there would be a minimum of five people in the radioroom just to examine the message itself. Then those people have to be convinced themselves, and then have to convince the commanding officer and the executive officer that the proper order has been received. That process is necessary for the appropriate keys and interlocks to be made available to be used by the rest of the crew.

The executive officer and the commanding officer must then inform the entire crew, as I described earlier. And so we have a large number of witnesses, people who have to be convinced that the appropriate authority has been received.

Senator EXON. You would need a large number of witnesses, perhaps up to five people in the radioroom, plus the commanding officer and executive officers.

Commodore LEWIN. Yes, sir. To look at the exact format of the message.

Senator EXON. Seven people.

Commodore LEWIN. Yes, sir.

Senator WARNER. I will direct this to Commodore Lewin, but others may join in.

Commodore Bacon's prepared statement indicates that, although we have planned and funded overhauls for the affected Poseidon submarines, we have also protected the option to dismantle them. This implies that the budget before the Congress contains all funds necessary to overhaul those Poseidon submarines that require overhaul, but that are also candidates if the President decides to continue to comply with SALT II.

Are these overhauls fully funded, or rather, is planning for these overhauls funded?

Commodore LEWIN. Both planning and execution funds are available, Senator, to do whatever the President directs.

Senator WARNER. I thank you.

Now, gentlemen, subject to your desires, we are prepared to go into executive session.

Senator LEVIN. Mr. Chairman, could I ask one more question in open session before we do this?

Senator WARNER. Yes.

RESEARCH ON COUNTERMEASURES

Senator LEVIN. Commodore, are we conducting any research on countermeasures to make sure that our submarine-launched ballistic missiles and RV's are able to defeat a Soviet SDI?

Commodore BACON. Senator, we are conducting reasearch and studies of requirements based on our intelligence estimates of the antiballistic missile threat from the Soviets. Admiral Clark is in charge of several of those programs.

Would you care to discuss that, Admiral Clark? There is not a whole lot to say in open session, but we are studying it.

Senator LEVIN. Whatever you can tell us in open session.

Admiral CLARK. What we are doing at this particular time is that we have a program which we have entitled the Vulnerability and Effectiveness Program in the R&D budget, which has the purpose of continuing to study all of the potential SDI threats that might develop based on the inteiligence information that we have available on the Soviet Union, as well as the development effort that is underway in the United States—the idea being that at this time we really cannot say what those threats are. It is very unpredictable in the sense that SDI today is a whole spectrum of possibilities. And so our plan then is to continue to study all of those things that seem to be the current trend, and then proceed to make whatever modification or take whatever actions we think have to be taken, such as not just modifying the missile but also perhaps evasion tactics or other such things as that as the threat begins to become formulated and becomes firmer. We think we have, as we understand the SDI programs, the time to approach it on that basis—in other words, we think the leadtime associated with our taking action in response is well within the leadtime that it takes to develop and field such a capability.

Senator LEVIN. Such countermeasure?

Admiral CLARK. Yes.

Senator LEVIN. Thank you.

Senator WARNER. There being no further questions, the committee will take a recess of about 3 minutes and then resume in executive session.

[Whereupon, at 11:28 a.m., the open hearing was adjourned, to be resumed in executive session.]

EXECUTIVE SESSION

Senator WARNER. The Chair is advised by counsel that the room is secure. We will now proceed into executive session.

Commodore, you may proceed.

Commodore BACON. Mr. Chairman, we have a short film on the Tomahawk cruise missile, if you would like to see it at this time.

Senator WARNER. Fine.

Admiral HOSTETTLER. Mr. Chairman, it is very short clip of about 3 minutes. It shows two flights, primarily the end game.

The first one is a submarine launch off the west coast to a target on San Clemente Island which shows the horizontal mode of attack in the final stage. You can see it coming in on the side of the building. The second part of the film shows a Tomahawk going to a land target. In this test it was surface-launched from a ship at sea off the west coast and went into what we call a vertical maneuver into the target. Last year I told you we were going to develop this capability which allows us to hit a wider range of targets with higher accuracy.

If we could run the film, please.

[A film was shown.]

Admiral HOSTETTLER. I might add that the target that we used on San Clemente Island, the one that was the concrete described as a concrete warehouse, was [deleted] heavy reinforced concrete. It was sized to a small Soviet missile assembly building. We were going for a real target to ensure the warhead actually passes through the concrete before it explodes and levels the building.

In the case of the second target, we again used a missile assembly building size—this time made of plywood—to depict our final 60 degree dive into the target. Of course, being capable of using the horizontal mode into a vertical type target as well as being able to attack at various angles gives our weaponeers a fair amount of flexibility at a target. The miss distance on that building, relative to where we understood it should hit based on our mission planning data, was off by less than 5 feet after a 400-mile flight. We are staying close to our 25-foot overall CEP.

Senator WARNER. What are your ranges now?

Admiral HOSTETTLER. It depends on the variant. The nuclear version has the longest range because the warhead is smaller enabling the missile to carry more fuel. Its range is about 1,500 miles.

Senator WARNER. Either sub launched or surface-launched?

Admiral HOSTETTLER. Yes, sir.

Senator WARNER. What depth can you launch from?

Admiral HOSTETTLER. [Deleted.]

Senator WARNER. Now, the conventional warhead, the ranges?

Admiral HOSTETTLER. The conventional warhead is heavier and bigger than the nuclear warhead, therefore, holds less fuel. The range off surface ships is approximately 700 miles. From submarines it is approximately 500 miles because one fuel tank is omitted to lighten the missile in order to get the missile through the water and to the surface.

Part of my baseline program is the development of an increased thrust rocket booster motor which will allow the missile to fly from full depth and get that same 700 miles that we get from the surface ship. That booster is planned for IOC in 1987.

Senator WARNER. What are the comparable missiles that the Soviets have, and how would you compare the Navy's capability with Tomahawk and the Soviet comparable system?

Admiral HOSTETTLER. The Soviets have been credited recently with a missile comparable to Tomahawk which is about to be deployed. There was a discussion last year as to whether they had in fact deployed their new land attack submarine-launched cruise missile. That particular missile is given credit for [deleted] range, and that includes standoff. We would assume their stand-off [deleted]. So you are talking something in excess of [deleted] penetration.

Senator WARNER. What size warhead?

Admiral HOSTETTLER. We don't know for sure what that warhead is.

Senator WARNER. The point being that they suffer comparable denigration of range when they shift to conventional.

Admiral HOSTETTLER. It is a bit heavier than ours, but the SS-NX-21, commonly called a Tomahawkski, because it looks almost like ours.

Senator WARNER. And the same sort of guidance system, you would presume?

Admiral HOSTETTLER. We don't believe that the SS-NX-21 carries the accuracy that we have. We don't believe that they have achieved the scence matching capability that we have at this time.

Senator WARNER. Now, Tomahawk, of course, has ship-to-shore and ship-to-ship. It is very versatile weapon.

Admiral HOSTETTLER. Yes, sir. We have the ship-to-ship variants, both submarine-launched as well as surface-ship launched. Both carry the same conventional warhead, by the way, that we use for the conventional land attack missile—Bullpup. It is the same common round missile from the wings back. The range of the anti-ship missile is about 250 operational miles because we go out and search to find our target. Then we have an active radar seeker in the missile to zero in on the target.

Senator WARNER. Now, that was an interesting shot with that plane. What was it, an A-6?

Admiral HOSTETTLER. Yes, sir. We do that for safety. Whenever we fly, we chase the missile with aircraft—to watch it, and also to take override control for safety reasons if necessary.

Senator WARNER. Now, a carrier task force could put out this CAP systems and have a pretty good interdiction.

Admiral HOSTETTLER. Yes, the carrier task group, using their EW aircrafts, could obtain pretty accurate target information, then pass it immediately to our launch platform. The platform would launch based on that information. [Deleted].

Senator WARNER. But an airplane can bring it down.

Admiral HOSTETTLER. No, sir, Senator. We use that on the test range for safety only. The FAA would just as soon we not let this pilotless airplane fly over their beach unless we have a backup safety system.

Senator WARNER. I appreciate that, but I am talking about in a tactical situation.

Admiral HOSTETTLER. That is not part of the operational system.

Senator WARNER. But the aircraft could bring it down. Our carrier task force aircraft could bring down those missiles.

Admiral HOSTETTLER. Oh, you mean our carrier aircraft could shoot down enemy missiles? Yes, sir.

Senator WARNER. And that is one of the means of defending——

Admiral HOSTETTLER. Yes, sir; no question about it. You are going to get it. You have got to find it, of course. You have to get some warning on it to get to it.

Senator WARNER. Senator Exon, do you have some questions?

Senator EXON. Yes, thank you, Mr. Chairman.

Admiral, in your view where are we vis-a-vis the Soviet Union with regard to cruise missiles.

What do we know from our intelligence as to how quickly they are catching up with our technology? Just give me a general assessment of where you think we are right now with regard to the Tomahawk, both ship-to-ship and land attack capability as compared with the Soviet SS-NX-21 missiles?

Admiral HOSTETTLER. Based on the intelligence information that I have access to, Senator, it is my view that the Soviets are about to field with SS-NX-21 a comparable system in terms of range and payload. It is my understanding that they do not have the guidance system accuracy developed that we have yet, and that probably could take anywhere from 2 to 5 years, let's say, in order for the Soviets to achieve that accuracy assuming they don't get help accidentally.

The Soviets tend to build their cruise missiles quite large. Their air launched, for instance, has a rather heavy payload and pretty good range. They stress range. They use large launchers, separate launchers, where ours are tailored to fit out of—the one you saw launched here was out of a common submarine torpedo tube, 21 inches. They are not constrained by that so they can tend to put more warhead and payload in.

If we have advantages it is my belief they are in the versatility of our launch systems and guidance accuracy. We can put them out of submarine tubes in addition to our vertical launch tubes. We have more platforms, I think, on the way relative to what they will have overall. I also believe our advantage is in guidance. I also think that we have a capability here in this country to stay ahead of them in cruise missile technology planned for the future. We must remain ahead in those areas.

Commodore BACON. Senator, I would add a little bit beyond a technology comparison of the Tomahawk program versus the Tomahawkski family of weapons. We have talked about the SS-NX-21 which has not yet made its initial operational capability. In addition to this sea-launched version they have developed, similar to our ALCM, an AS-15, and similar to our ground-launched cruise missile, an SSC-X-4. [Deleted.]

In addition to that family, which is similar to our Tomahawk, they have also continued development of the SS-NX-24, a larger supersonic cruise missile with much longer range and probably a heavier payload. The initial operational capability of that missile, I believe, is further down the road as compared to the SS-NX-21, but they press on with both types of missiles.

Admiral HOSTETTLER. And we do not have a supersonic cruise. Assuming they bring this in [deleted] which is I guess our latest estimate, that will be a difficult one.

Senator EXON. Is it generally true that we are moving quite aggressively ahead on a program to have these Tomahawks on most

of our ships of the fleet? Won't this create potential for additional problems such as the current ANZUS crisis?

Commodore BACON. That is true. As I mentioned earlier, in the 1990's we will be up to 101 submarines and 82 surface ships with the Tomahawks installed but that is really no change from what our Navy has done in the past. We have dual capable aircraft—capable of carrying nuclear weapons or conventional bombs—on our carriers. We have had tactical nuclear weapons such as the nuclear BTN Terrier on surface ships. We have had submarine rocket and ASW tactical nuclear systems on submarines for years. The fact that with Tomahawk we are introducing a system which has conventional and nuclear capability has not changed the overall picture of the Navy's capability to deter theater nuclear war by having its own nuclear force available to it.

Senator EXON. But as you testified earlier, the main responsibility of the Navy is to keep our sea lanes open. This is another layer of responsibility that you have placed on our ships.

Does it require any additional personnel to support Tomahawk?

Commodore BACON. It does not require additional personnel. It requires the people on that ship, just as today on ships with nuclear capability, to be trained and to understand fully the procedures to handle the nuclear capable weapon system on board that particular ship. This includes such things as the personnel reliability program and the ability to maintain the nuclear surety of the system on the ship. It requires training and special effort from the commanding officer right on down to everyone associated with a nuclear system on a surface ship or submarine.

Senator EXON. Let me ask a very mundane question that will indicate to you my lack of scientific understanding of the Tomahawk cruise missile.

Let's say that in those two pictures that we saw on the two imaginary warehouses that if the Soviets had an indication that we had launched some cruise missiles, and if they knew about when that missile would arrive, are there not any simple decoying techniques that they could use to confuse and throw off the Tomahawk as it made its final approach?

Admiral HOSTETTLER. None that we understand they could develop aside from, as you approached, changing the whole visual complexion of the scene. We are not using radar or IR, so you don't have radar signatures that can be manipulated; you don't have IR signatures that can be manipulated. We are literally looking, straight down at the terrain, at certain points just prior to the target.

Senator EXON. And it is very difficult to change the terrain.

Admiral HOSTETTLER. I agree you can bulldoze it away. But you would always have to keep changing—that's not economical or likely.

For every offense, you may always find defense, and then you make your offense a bit better. That never stops.

Senator EXON. But that's what makes our land attack Tomahawks pretty effective?

Admiral HOSTETTLER. Yes, sir.

Commodore BACON. You saw a picture of it crossing the coast on an inland shot. We plan the Tomahawk missions to cross the coast

at various points. There is not a specific spot on the coast required for the mission planner. He can pick other spots to make sure that the missile crosses in the least defended area, bypassing defended areas, using the terrain for masking, flying below radar horizons while it is matching the terrain, and zeroing in on the target with digital scene matching. That is the way the mission will be planned.

Senator EXON. From the pictures that we saw of the Tomahawks flying, I couldn't tell the height. Were they flying below what we would normally consider easily detectable surveillance? Were those considered low-level flights?

Admiral HOSTETTLER. In the final stage it was. Because of the range considerations you have to fly rather high up until you get closer into the target because they want to keep watching you on radar on purpose for saftey reasons, but as we came in on our final scenes, we were flying [deleted]. In the second case we were flying [deleted]. And on the second one, which was at China Lake, we flew over the beach into China Lake, a full flight. We deliberately came in low. [Deleted.]

If the enemy had had a defense sector around that target, he wouldn't have gotten us in time. If he had had defenses up the route, then he could have. When we plan missions, as Commodore Bacon says, one of the things a mission planner does [deleted]. So we try also to increase our survivability by flying around his site as best we can.

Senator WARNER. I wonder if I might ask some questions and then you finish up.

Senator EXON. I am going to finish right now, Mr. Chairman.

How high was that Tomahawk flying when they came over the coastline? It looked to me like it was higher——

Admiral HOSTETTLER. No; when it hit the coastline it was about 5,000 feet because the hills are about 4,000. That is coming up just south of Vandenberg. The mountains are almost straight up from the water. So we climb up and go over the mountains at about 5,000 feet altitude. That is rugged terrain.

Senator EXON. Thank you. It was an interesting presentation. I appreciate it.

Thank you, Mr. Chairman.

Senator WARNER. I am going to ask counsel to submit a few questions.

Have you finished?

Senator EXON. I have finished.

Senator WARNER. All right. Thank you, gentlemen.

I have to attend another appointment. I will ask counsel for the subcommittee to ask you a few more questions in closed session.

E–6A

Mr. BOTT. Admiral Layman, in the earlier questioning I believe you were discussing the E–6A, and you indicated that you had an additional point to make in closed session.

Could you make that point at this time?

Admiral LAYMAN. Yes; I would be pleased to do that.

I would like for us to keep in mind that in the normal peacetime environment, unstressed, as we normally refer to it, we have a multitude of communications systems which provide connectivity from the National Command Authority to the submarines at sea. The very difficult area that we deal with is in the trans-attack, that period of time when the United States would be undergoing attack. We would give credit to the enemy that he would attack those [deleted].

We would anticipate that those communication nodes, [deleted]. Therefore, that is the real purpose of the airborne Tacamo relay aircraft, to give us, as we currently have both in the Atlantic and the Pacific, an airborne 24-hour-a-day capability to relay the emergency action message. Tacamo [deleted] is capable of transmitting at any time.

We would anticipate that the enemy would use VLF sites, fixed VLF sites that he has available, [deleted].

Now, when you put all this together under very detailed analysis, [deleted].

In the Pacific our aircraft must maintain the connectivity back over the continental U.S., and he must be in a position to clearly cover with high probability the entire operational area for the Trident force.

Our analysis, which there is agreement on between all parties, our analysis says that the aircraft must be located [deleted] in order to provide a high degree of probability that a Trident located in any part of the operating area would receive the emergency action message. If the airborne relay platform that you are using does not have the endurance, the range, or the speed or sufficient number of aircraft such that you would drawback to a closer arc to the United States, then obviously you achieve at the same probability less operating area.

Now, some specific numbers. Currently today the Trident's operate in a position such that Tacamo on the west coast operates [deleted]. That provides a connectivity [deleted] the designated Trident operating area that we currently have for operational, although they may not always be at sea. As you increase the Trident force where you would expect a larger number of units at sea, in order to maintain the same density you would want to use a larger operating area. That requires you to go out with your relay platform a greater distance.

If you do not have a platform capable, then you will of necessity have to restrict the operating area, and this is a decrease, without quantifying it, on the survivability of the submerged submarine.

Mr. BOTT. Thank you, Admiral.

THREATS TO SSBN FORCE

Commodore Lewin, there was an earlier discussion with regard to published threats to the SSBN force, and I believe Dr. Harper said he had some additional comments to make.

Have you any additional comments to make briefly in that regard?

Commodore LEWIN. I think as a general summary I should state that in the Navy, in our SSBN Security Program, we examine

every conceivable antisubmarine warfare technology that we are aware of or that we suspect others are aware of to determine if there is any potential for any one of those systems to operate against our submarines. We either determine there is no potential threat to our SSBN's or if we see some potential, we can either develop a counter-measure or a tactic which allows us to continue to enhance and maintain the undetectability of our strategic submarines.

Dr. Harper is ready to address in a little more detail the synthetic aperture radar nonacoustic technology that the Soviets are pursuing in a very basic research area, as well as discuss the general knowledge of nonacoustic ASW, if that is appropriate.

Dr. HARPER. I would be glad to do that.

And another question I am asked in the acoustic arena has to do with [deleted] and I can discuss that if you would like.

Mr. BOTT. Could we have the Bear F discussion for the record. Do you have a few charts?

[The information follows:]

SOVIET BEAR F ACTIVITY

The information on recent Bear F antisubmarine warfare activity in the Atlantic Ocean is attached.

[All of the attachments are deleted.]

Mr. HARPER. With respect to nonacoustic ASW, the most recent national intelligence estimates, which I point out are all-source documents, indicate that the Soviets [deleted] in the foreseeable future. In intelligence, the word "foreseeable" means about 10 years.

With respect to synthetic aperture radar, or SAR, the Navy has developed models of SAR performance and we used them to process Seasat images of the ocean [deleted]. This is as we predicted. We have initiated within the Navy two large experimental programs that were initiated by the Office of Naval Research in the 1984. They are aimed at improving our basic physical understanding of radar interactions with the ocean surface. Several eminent institutions have participated in those experiments, the Jet Propulsion Laboratory, the University of Michigan, and Johns Hopkins University.

Our current estimate of SAR capabilities is that synthetic aperture radar can detect [deleted].

The Navy is continuing its SAR research both for antisubmarine warfare, which is the responsibility of the Director of Naval Warfare, and for SSBN security, which is the responsibility of the Deputy Chief of Naval Operations for Submarine Warfare.

Further, the Navy supports the congressionally mandated, authorized CIA ASW study. That congressionally mandated study [deleted] should provide another independent assessment of fundamental physical limits of detectability.

I would just like to add that there is a whole menu of nonacoustic detection technologies which Navy is exploring, [deleted]. All of these are being pursued in the submarine security research.

Mr. BOTT. Thank you, Dr. Harper.

Admiral Clark, the committee is anxiously awaiting the report with regard to penetration aids research and options that were requested last year.

THREAT POSED BY SOVIET ABM BREAKOUTS

Would you share with us your view of the threat posed by the possibility of Soviet ABM breakouts or capabilities of dual-mode SAM's? How is the Navy prepared to respond to these, and in what time period?

Admiral CLARK. I think the threat picture with regard to breakout of the Soviet Union—a widespread breakout of the Soviet Union ABM system [deleted]. The Department of Defense and the Office of the Secretary of Defense have been studying the various options that should be pursued [deleted] and I made reference to that study I believe last year. Unfortunately, the study has not been fully completed, and it is still in the final stages of completion in the Office of the Secretary of Defense.

I think, as you know, we do have some penetration effort under way, in particular as it relates to Trident II, and this is, of course, pursuant to the direction that was put into the language last year. That effort in Trident II breaks down to two principal areas: [Deleted].

The second area is to protect as best we can [deleted].

Mr. BOTT. Thank you, Admiral Clark.

There are a number of detailed questions that I would like to submit for the record in the interest of time. They include questions that are motivated by the fact that we may well have to make some very uncomfortable recommendations with regard to strategic budgets this year given the kinds of numbers we have been talking about in the budget committee So we will provide those for the record, and I think it is going to be very important that responses to those be provided on a timely basis so that they can influence the markups that will take place later this month.

I would like to invite the witnesses to make any other statements they might have at this point in closed session with regard to the status of the Trident II missile, the Trident submarine or anything related to the sea-based force.

Admiral CLARK. Let me summarize in a little more detail than was stated in the opening statement on the status of the Trident II program.

First, I would like to remind the committee of the three basic elements to ensure that the Trident II program meets the planned IOC date of December 1989. These elements include the facilities at the King's Bay submarine base that will be required to support the Trident submarine with the D–5 weapon system; obviously, the construction of a submarine configured appropriately to handle the D–5 missile; and finally, the strategic weapon system which includes not only the missiles but all of the weapon system subsystems such as navigation, fire control, launcher and test instrumentation that must be included in the submarine.

By way of summary, let me say that we are now in our second year of full scale engineering development and production for the shipboard weapons systems equipments. We are somewhat less

than 2 years away from our first flight test. All of our major milestones are on schedule and within cost projections.

The performance objectives of the Trident II program in terms of payload, in terms of warhead yield, in terms of range, and in terms of accuracy, we believe are going to be met. The King's Bay, GA, support facilities for the Trident submarine with D-5 capability have begun construction. We have additional construction effort that is in the 1986 budget and in the 1987, 1988, and 1989 programs. We are now about 5 years until initial deployment, again shooting for the December 1989 King's Bay, GA, deployment.

The first Trident submarine with D-5 capability is the ninth Trident submarine, the 734. It is on schedule, and all of the weapons systems design information that is required to support that construction is being provided in accordance with the shipbuilder's needs.

In summary, I would say that the program is on track. It is within our cost projections, and we fully expect at this time to meet our performance objectives.

Mr. BOTT. Thank you, Admiral Clark.

Commodore Bacon?

Commodore BACON. In summary, I would like to stress the value of full modernization of the sea-based leg of the triad. In my discussion with Senator Levin on first strike, the real issue is deterrence. Deterrance equates to the value of our strategic forces in the eyes of the Soviets, the eye of the beholder—not in my view of the United States view. Our strengths to deter aggression are being developed through the President's modernization program. In the Navy, we are developing the Trident II D-5 missile to be capable of holding at risk the full spectrum of Soviet targets. This will include those targets which the Soviets prize most—their leadership bunkers, their ICBM silos, their hardened command and control facilities—those types of assets which are very important to the Soviets and which therefore we need to have the capability to put at risk.

We will be able to do that through the improved accuracy—the [deleted] goal toward which Admiral Clark is working—and the [deleted] yield of the Trident II D-5 missile.

So our modernization is very important to this Nation to increase our deterrent posture, and I certainly urge the committee's full support in our efforts.

Mr. BOTT. Commodore Bacon, gentlemen, on behalf of Senator Warner, I want to thank you very much for your attendance this morning and your responsiveness to the questions of the committee.

And if there are no further desires on your part to add additional material for the record, we do ask your response to the questions that we will providing. This session is adjourned.

[Questions with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR JOHN WARNER

SLCM

Senator WARNER. Secretary Lehman and Admiral Watkins testified that they were in favor of on-site inspection in order to enhance verification of submarine

based cruise missiles. Can you comment on the operational implications of such inspection procedures?

Commodore BACON. We will have to be very careful in developing procedures for on-site inspection. I believe procedures can be developed which could both present the Soviets with enough information to verify the status of cruise missiles onboard submarines inport, and prevent the Soviets from obtaining any unrelated information we did not want them to have.

As the Secretary of the Navy has said, submarine launched cruise missiles pose no more difficult a problem for arms control verification than our already-existing systems, such as dual-capable aircraft. The Navy stands ready to accept whatever intrusive means of arms control inspection are negotiated. Nevertheless, no procedure we could develop keeps either side from changing a ship's weapon loadout shortly after it has been inspected. On-site verification will not completely solve the arms control verification problems engendered by the cruise missile.

TOMAHAWK DUAL SOURCE

Senator WARNER. What is the minimum production rate required to support the dual sourcing arrangement? What would be the total cost to the program if the fiscal year 1986 procurement was reduced to these levels? And what would be the total cost to the program if the fiscal year 1986 procurement was reduced below the levels that could sustain dual sourcing?

Admiral HOSTETTLER. Calculation of the minimum production rate required to support the dual source program is a multifaceted calculation; it is also somewhat speculative in that it requires some predictions of what strategies will be discussed in the corporate board rooms given each company's tax, cash flow, and business base situation.

The minimum sustaining dual source quantity can be described as a curve. In order to induce the companies to make the heavy capital investment required to manufacture Cruise Missiles the Government promised each manufacturer a guaranteed floor or minimum percentage of each year's buy (40% each in fiscal year 1985 and 1986; 30% each thereafter). Over and above this floor are the competition quantities. (It should be noted that each company must bid the entire quantity on a curve to prevent its bidding the guaranteed portion inconsistent with the competitive quantity). As quantities are reduced, the Government has fewer missiles to offer as the "swing" or competitive quantity. As quantities are reduced the contractors perceive the Government in a position where it can only award a 50/50 split; in effect the Government would have two, uncompetitive, sole sources, with very little leverage to include reductions in cost, especially in the area of Systems Engineering and Program Management, the prime source of price reduction in competition. At about 240 missiles per year (10 per month for each contractor) the contractors approach the minimum sustaining rate, regardless of competitive considerations. This means the contractors are at the point where plant inefficiencies start forcing the missile costs up out of proportion to the quantities. This is largely due to the manufacturers' inability to further reduce the fixed costs associated with the basic manufacturing operation in proportion to the reduction of missiles.

The Joint Cruise Missiles Project Office calculates that point at which dual source is no longer viable as an acquisition strategy is at the 300 missile point in fiscal year 1986 and 400 in fiscal year 1987 and beyond. Any quantity below the 300 or 400 missile mark in effect creates two sole sources. The fiscal year 1986 request of 344 missiles (249 SLCM and 95 GLCM) creates about a 70 missile swing quantity, or roughly a $7.0M to $9.5M profit for which to compete, discounting business base and tax considerations. The accompanying chart shows the rapid increase in unit price, expressed as a percentage of the fiscal year 1986 predicted unit price, which occurs as quantities are reduced below the 344 mark. The 344 missile unit price is expressed as 1.0 to protect company sensitive date already in the hands of the Government.

The term "Dual Source" is generally applied to the All-Up-Round, or air vehicle including the guidance section, cannisters, capsules, and containers. The other integral parts of the missile (engine, radar altimeter, booster, digital scene matching area correlator (DSMAC) and reference measuring unit computer (RMUC) are also in competition, and the same phenomenon applies.

If a reduction of missiles were so drastic that it engendered a cancellation of dual source, other basic considerations must be addressed.

1. One of the pillars of the dual source program is the capital investment incentive programs offered to both contractors. Upon cancellation of dual source, the Gov-

ernment is liable to both contractors for the unliquidated balance of these costs, currently estimated to be in the area of $75.0M.

2. Since both companies are now qualified to produce the guidance sets and the airframes, cancellation would not necessarily mean General Dynamics would continue producing air frames and McDonnell Douglas would receive all guidance sets. An all years, "winner-take-all" strategy might be in the best interests of the Government.

3. The dual source program goes beyond the manufacturing of the missiles. The dual source program has produced two depots for missile repair and guarantees competition into the support phase of the program, both during the acquisition phase and for at least a decade beyond. The two depots also offer the Navy both east and west coast facilities, even further reducing support costs.

4. Each contractor has over 150 missiles under dual source contract at this time. The cost and quality control incentives of the financial loser in any return to sole source would be immediately lost, forcing the Government to have those missiles completed by the new sole source contractor, causing untold disruption and cost growth in the program.

If the fiscal year 1986 program were reduced to 300 missiles for the 344 missile request, the 300 missiles would experience a $31M cost growth. If dual sourcing were no longer sustainable, the program total cost would rise at least $750M. Again, the amount is somewhat speculative, but it is based on studies of sole source performance and cancellation and termination changes. This figure also assumes that the fiscal year 1985 dual source procurement would be terminated and returned to sole source.

Senator WARNER. Can you quantify the savings that the Tomahawk program has realized as a result of dual sourcing?

Rear Admiral HOSTETTLER. It should be noted that all missile assemblies are procured by a competitive dual source arrangement. This includes the all-up-round including the air frame and guidance, the reference measuring unit computer, the engine and the booster. The budgets submitted to Congress for the past several years have always included the competitive assumptions extant within the program. This means the program's dual source results are compared to its dual source assumptions. The recent all-up-round competitive proposals show the current budgets to be within plus or minus a few percentage points of the proposals for the outyears. The JCMP imputed sole source program costs would have been $300–500M greater than what was realized by maintaining a dual source acquisition strategy. Additionally, the out-year (fiscal year 1985-fiscal year 1989) operating and support costs reflected in the proposals indicated that a sole source approach would be about 20 percent greater than our current competitive depot program.

TRIDENT I

Senator WARNER. Will you provide the committee with an update on t Trident I performance since the discovery of motor problems and also, please i icate the progress you have made in identifying the source of the original problem?

Admiral CLARK. Overall performance of the Trident I missile has been excellent. In-flight reliability as measured by submarine launches of production missiles during demonstration and shakedown and oeprational tests is well above objective. With regard to first stage motor performance, there have been no further failures in the 28 missiles tested since April 1983, the date of the last failure. These tests indicate that our corrective actions have been effective. Nevertheless, we do not yet feel that the ballistic anomaly problem which caused 4 failures in the early operational test program is sufficiently well understood. We are continuing our investigations to obtain a more detailed comprehension of this failure mode.

TRIDENT SSBN

Senator WARNER. On several occasions, the Navy has submitted reprogramming requests that reflect repricing of Trident SSBNs to lower levels than originally requested. What is the potential, in your judgment, for such a downward repricing adjustment on the fiscal year 1986 Trident submarine?

Commodore LEWIN. Prior to the completion of the President's fiscal year 1986 budget, the Navy adjusted downward the funding levels on the 1986 and later Trident submarines. These downward adjustments were based on current pricing estimates in the Trident submarine program. At this time the Navy sees no additional reduction in the cost of the 1986 Trident submarine beyond those already incorporated during budget preparation. Yearly assessments of ship cost factors through continuous review of the program could result in later pricing adjustments.

POSEIDON SUBMARINES

Senator WARNER. In Commodore Bacon's prepared statement, he indicates that "although we have planned and funded overhauls for the affected Poseidon submarines, we have also protected the option to dismantle them if required." This implies that the budget before the Congress contains all funds necessary to overhaul those Poseidon submarines that require overhaul, but that are also candidates for dismantlement if the President decides to continue to comply with SALT II. Are these overhauls fully funded or rather is planning for these overhauls funded?

Commodore LEWIN. All fiscal year 1986 Poseidon submarine overhauls are fully funded. In adddition, the fiscal year 1986 budget funds required advance planning for follow-on year overhauls.

TRIDENT II

Senator WARNER. Can you tell us about the basis for your current estimates of Trident II accuracy and how confident you are in them? Also, at what point in the program will the operational commander be confident in these accuracy estimates?

Admiral CLARK. The projected accuracy for the Trident II missile is [deleted] CEP at 4000 NM.

There is slightly better than 50% confidence that this will be achieved based on the work done during the Improved Accuracy Program conducted during the 1976 to 1982 period. The IAP provided the initial definition and laboratory/breadboard testing of the major accuracy improvement constituents of the Trident II Weapon System. Since that time, full scale development has been initiated and advanced development models of major subsystem elements have undergone additional testing.

For example, both the Gravity Sensor System and Navigation Sonar System are currently being tested at-sea abroad the Navigation Test Vehicle. All results of component and integrated subsystem ground testing on the guidance and missile as well as analysis of the gravity data being collected for the weapon system continue to support the achievement of the accuracy objective.

Our development test program is constructed to provide a best engineering estimate of the accuracy at the time of initial deployment of Trident II for use by the operational commander, as has been the practice in all prior programs. In past programs our best engineering estimates have been conservative. After deployment the operational test program conducted from deployed D–5 submarines will provide the data for a confident assessment of Force accuracy. We have planned the program to provide an accuracy evaluation system sufficient to establish a 90% confidence that the deployed accuracy will be known to within 15% of the true CEP. This should occur by about 3 years after IOC.

Senator WARNER. The Trident II missile development program request of just over 2 billion dollars must be subject to close scrutiny in view of the deficit situation. Can you provide for the record the impact of reducing this request by five percent increments up to twenty percent? What corresponding adjustments would have to be made in the submarine and at Kings Bay?

Admiral CLARK. I certainly appreciate the fact that our budget request is subject to close scrutiny. I would like to point out first that our budget request is based to a great extent on dollar values which are a direct result of contract negotiations for the entire Trident II development and initial production. The contracted effort covers the period from start of full scale engineering development through the late 1989 initial operational capability. Considering your budget reductions of 5, 10, 15 and 20 percent, I believe it would be most appropriate to judiciously apply these reductions to different appropriations in differing amounts in order to achieve a balanced acquisition program which would minimize cost increases and schedule stretch-outs. Therefore, in my reply, I have assumed that the percentage reductions you refer to would be applied to the total of the Trident II requests for RDT&E—$2166M, WPN—$582M, and OPN—$240M. The total of these three requests is $2,988M and in answering your question I have applied reductions of 5, 10, 15 and 20 percent to this total. Rather than take a proportionate cut across the three appropriations, I have indicated the amount, if any, to be cut from each appropriation to reach the correct total for each postulated reduction. Further, in my assessment of these reductions I made the assumption that we would not take any actions which would impact the construction of the Trident submarines which are currently under construction at Electric Boat with Trident II capability. The first of these to be Trident II capable is scheduled for delivery to the Navy in late 1988. Any government-caused delay to the schedule of these Trident II configured submarines would have extremely significant impacts on the entire Trident submarine program. I will therefore reflect the hypothetical budget reductions only against those accounts which support the missile, guidance and reentry body efforts on Trident II. In addition, if required to restructure the program, my intention would be to maintain the same confidence in meeting the performance and new schedule as I had in the baseline program. Having made these assumptions, then your 5, 10, 15 and 20 percent reductions represent reductions of 7.3, 14.5, 21.8 and 29 percent of those efforts not associated with the construction and delivery of the Trident II capable submarines. The impact of reducing our fiscal year 1986 budget by your requested percentages is as follows:

5% reduction against fiscal year 1986 request of $2988M (7.3% against non-SSBN related accounts)

This reduction of $149M (RDT&E: $59M; WPN: $90M) would result in an estimated six month slip in the initial operational capability of the Trident II missile and the missile assembly facility at Kings Bay, Georgia. Total program costs would increase by about $50M. Additionally, there would be a loss of about 16 D–5 submarine deployed (on Trident II deterrent patrol) months.

10% reduction against fiscal year 1986 request of $2998M (14.5% against non-SSBN related accounts

This reduction of $299M (RDT&E: $137M; WPN: $162M) would result in an estimated nine month slip in the initial operational capability of the Trident II program and a corresponding 9-month slip in the missile assembly facility at Kings Bay, Georgia. Total program costs would increase by about $100M. Additionally, there would be a loss of about 28 D–5 submarine deployed (on Trident II deterrent patrol) months.

15% reduction against fiscal year 1986 request of $2988M (21.8% against non-SSBN related accounts

This reduction of $448M (RDT&E: $223M; WPN: $225) would result in an estimated one year slip in the initial operational capability on the Trident II program, a corresponding one year slip in the missile assembly facility at Kings Bay, Georgia, and a six month slip in the start of the development flight test program. Total program costs would increase by about $150M. Additionally, there would be a loss of about 80 D-5 submarine deployed (on Trident II deterrent patrol) months.

20% reduction against fiscal year 1986 request of $2988M (29% against non-SSBN related accounts

This reduction of $598M (RDT&E: $373M; WPN: $225M) would result in an estimated 15 month slip in the initial operational capability of the Trident II program, a corresponding one year slip in the missile assembly facility at Kings Bay, Georgia, and a one year slip in the start of the development flight test program. Total program costs would increase by about $250M. Additionally, there would be a loss of about 88 D-5 submarine deployed (on Trident II deterrent patrol) months.

TRIDENT SSBN

Senator WARNER. What would be the impact of an interruption in the submarine construction schedule if the fiscal year 1986 submarine were deleted as a budget cutting measure?

Commodore LEWIN. The impact of an interruption in the submarine construction schedule caused by the deletion of the 1986 Trident submarine would be cost increases due to the following: an increase in basic man hours caused by disruption in shipyard manning levels; inefficiencies in suppliers' deliveries; and interruptions in production sequencing. Additional cost increases could result from an increase in shipyard overhead if the workbase is reduced, and the expiration of contract options for major government furnished equipment components. In addition, it is estimated that there would be a significant layoff of skilled shipyard labor due to the break in production sequencing, and similarly, layoffs in industries providing government furnished equipment.

THREAT TO SSBNS

Senator WARNER. There have been a number of recent articles in the press about Soviet anti-submarine developments, including the possibility of space based sensors. Can you, or Dr. Harper, comment on the accuracy of these articles, and can you provide us your assessment of submarine based survivability for the foreseeable future?

Dr. HARPER. Articles have periodically appeared in the press which claim that the Soviets have developed space based sensors of various operating principles that have the capability to detect submarines. The Soviets do have an intense anti-submarine warfare (ASW) developmental program. [Deleted.] We have thoroughly investigated the feasibility of each of these potential systems. The results of our investigations, [deleted].

Our SSBN Security Program continually evaluates this dynamic situation as technology develops. We must continue these vital efforts to remain ahead of the threat. Through the SSBN Security Program and the improvements in survivability in our submarines and weapons systems, we expect to counter future threats which might develop from Soviet research and thus ensure the survivability of our SSBN force [deleted].

TRIDENT SSBN

Senator WARNER. On several occasions, the Navy has submitted reprogramming requests that reflect repricing of Trident SSBNs to lower levels than originally requested. What is the potential, in your judgment, for such a downward repricing adjustment on the fiscal year 1986 Trident submarine?

Commodore LEWIN. Prior to the completion of the President's fiscal year 1986 budget, the Navy adjusted downward the funding levels on the 1986 and later Trident submarines. These downward adjustments were based on current pricing estimates in the Trident submarine program. At this time the Navy sees no additional reduction in the cost of the 1986 Trident submarine beyond those already incorporated during budget preparation. Yearly assessments of ship cost factors through continuous review of the program could result in later pricing adjustments.

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QUESTIONS SUBMITTED BY SENATOR DAN QUAYLE

SOVIET AIR DEFENSE SYSTEMS

Senator QUAYLE. How effective are Soviet air defense systems such as the SA-10 and SA-X-12 against our Poseidon and Trident I missiles?

Admiral CLARK. Studies conducted during 1983 indicated that the ballistic reentry systems of the Poseidon and Trident I SLBM's provide [deleted] capability against the near term SA-10 and SA-X-12 air defense systems operating in an Anti-Ballistic Missile (ABM) mode. The latest assessment of the intelligence community [deleted]. In the near term Poseidon and Trident I ballistic reentry systems [deleted].

LASER RING GUIDANCE

Senator QUAYLE. Is it possible to retrofit Trident II with an advanced laser ring gyroscopic inertial guidance package? If this was done, how much would it cost and what percentage decrease in the missile's estimated CEP would this change produce?

Admiral CLARK. The packaging density and the existing electronic architecture of the Trident II missile are such that retrofit in the sense of substitution is not possible. Use of a ring laser gyro in Trident II would require a complete redesign of the Inertial Measurement Unit and the guidance system electronics. Ring Laser gyros with appropriate performance and small enough to be used in a redesigned Trident II guidance system would also require considerable development effort. Assuming success in meeting performance objectives the accuracy of such a system, when used in a stellar inertial mode, could be about the same as current Trident II estimate. This approach would significantly increase program cost and delay IOC by 2 to 4 years.

MISSILE ACCURACY

Senator QUAYLE. If Trident II's inertial guidance package remained the same or was improved as outlined in question one, if stellar update was used, and if the missile's payload was reduced to achieve the approximate range of the Minute Man III, what range of estimated CEPs could we expect if the missile was fired from a fixed point on land?

Admiral CLARK. Using the Trident II inertial guidance package with stellar update, which is the present baseline, the estimated CEP [deleted] MK-4 reentry bodies or [deleted] MK-5 reentry bodies the estimated CEP for a land based Trident II [deleted]. We do not believe that the use of a Ring Laser Gyro (RLG) or any other approach would improve system accuracy of a submarine launched ballistic missile.

TOMAHAWK MISSILE ACCURACY

Senator QUAYLE. I understand that the accuracy of our cruise missiles could be increased both by development of autonomous terminal homing and by modifying DSMAC to be a forward looking system. If, as Secretary Weinberger has assured me, increased missile accuracy and discrimination is a top priority, why shouldn't the efforts be accelerated? Do you think that $200,000 for studies of forward DSMAC and a similar sum to study if more accurate cruise missiles are needed is the best and highest priority the Navy can give?

Admiral HOSTETTLER. The accuracy of the Tomahawk guidance system is sufficient for the current Navy target set. The Navy is working with the Air Force to determine the requirement for and capability of improving the terminal homing system for other target sets. This ongoing effort is sufficiently funded.

SUBMARINE LAUNCHED SAM'S

Senator QUAYLE. Do the Soviets have a submarine SAM system that could be used against our P-3s?

Commodore BACON. The intelligence community estimates [deleted].

Senator QUAYLE. Isn't the current P-3 practice to loiter as close to the surface of the ocean as practical?

Commodore BACON. When preparing to attack a contact, P-3's operate [deleted] dependent upon weather conditions, sea state, visibility and time of day. In the initial search mode P-3's operate [deleted].

Senator QUAYLE. If the Soviets have or are developing a sub-SAM, wouldn't it be safer for our P-3s to fly further from the surface? What could be done to enable them to do this and still maintain their detection capability?

Commodore BACON. [Deleted].

TOMAHAWK WARHEAD CONVERSIONS

Senator QUAYLE. Wouldn't the ability to convert nuclear warheads on TLAM/N to conventional warheads and the reverse on board our ships increase the flexibility of our cruise missile force? What is the Navy doing to achieve such capability?

Admiral HOSTETTLER. Yes, but such flexibility would come at a high cost. The current cruise missile is a highly complex vehicle which was not designed for field maintenance. Each missile is thoroughly tested before it leaves the factory and remains intact until it is fired or returned for recertification in 30–36 months. During the period the missile is in the fleet, electrical continuity is maintained. To change a variant from conventional to nuclear or vice versa would require replacement of the entire front one-third of the missile. Nuclear surety requirements would dictate a complete retest of the missile requiring each ship be outfitted with highly sophisticated test equipment and highly trained technicians to interpret the results. Clearly, this is beyond the scope of normal Navy maintenance concepts, and will be performed only at shore-based depots. The capability to modify variants in the fleet is not planned for Tomahawk.

SSBN C^3I

Senator QUAYLE. What, in your opinion, is the weakest link in the Navy's C^3I for its SSBN force?

Admiral LAYMAN. The weakest link in the Navy's C^3I to its SSBN force is the lack of endurance. An analysis of major Navy strategic communications improvements quickly reveals that they all provide some improvement in C^3I endurance. The one exception is the ELF program which is intended to give greater operational flexibility to the SSBN vice improve C^3I endurability.

FOREIGN NAVY SSN'S

Senator QUAYLE. Recently, it was reported that the French are now considering whether or not to offer some of their nuclear attack submarines conventionally armed for export. Currently, Brazil, Argentina, the PRC, and India have announced intentions to develop or expand existing nuclear attack submarine forces. Is the prospect of nuclear attack submarine proliferation of concern to the Navy?

Commodore BACON. The required investment of technical, industrial, and financial resources for both the development and support of nuclear powered ships is significant, and generally will deter the great majority of countries with the exception of major naval powers. Although India, Argentina, and Brazil have expressed an interest in procurement of these vessels, it is unlikely that any of these countries will attempt such a major undertaking for the foreseeable future.

The PRC presently has a nuclear submarine force.

[Deleted.]

The French have not given us any indication that the small nuclear powered attack submarine they are building for their own Navy will be available for export.

Maintaining a technological edge is a vital concern for all branches of the military. The technology transfer aspects of procurement of nuclear attack submarines by such states as Argentina, Brazil, and India is of considerable concern to the Navy.

PRC SSBN'S

Senator QUAYLE. Does the Navy currently track PRC SSBNs and nuclear attack submarines?

Commodore LEWIN. [Deleted.]

QUESTIONS SUBMITTED BY SENATOR JEREMIAH DENTON

PORT EGRESS MEASURES

Senator DENTON. What measures are taken to ensure safe and undetected egress of missile submarines from home ports and through choke points enroute to station?

Commodore LEWIN. Undetected port egress is not always possible prior to submerging.

After submerging, port egress security is maintained by:

a. [Deleted.]

b. Following the approved type commander guidance in the Submarine Tactical Security Manual with respect to port egress security enhancements

c. [Deleted.]

d. [Deleted.]

e. [Deleted.]

f. [Deleted.]

g. Operations conducted by individual ships [deleted] that could be detrimental to their remaining undetected.

[Deleted.]

The Navy's SSBN security program is also studying potential [deleted].

In summary, the Navy's SSBN Security Program is extremely thorough in evaluating every phase of SSBN operations to ensure their survivability. Secure egress is a considerable and essential part of this ongoing effort.

DEVELOPING SOVIET SSN FORCE

Senator DENTON. How stressing is the developing Soviet SSN force, particularly the deployment of Soviet SSNs to areas adjacent to U.S. SSBN bases?

Commodore LEWIN. The current level of Soviet SSN activity adjacent to our SSBN bases [deleted].

SOVIET ABM CAPABILITIES

Senator DENTON. In addition to Boost/Post-Boost, how vulnerable is the Low-Beta SLBM RV to Soviet ABM capabilities including dual purpose SAM's now approaching deployment, particularly in penetration to the Moscow Target Set?

Admiral CLARK. The Navy does not have a Low Beta reentry vehicle in the SLBM inventory. The last Low Beta reentry vehicles were retired from fleet use in 1982.

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN

D-5 FLIGHT TEST

Senator LEVIN. When do you anticipate the first flight of the Trident missiles?

Commodore BACON. The first flight test is scheduled to take place in January 1987.

TLAM/N CAPABLE SURFACE SHIPS

Senator LEVIN. How many surface ships now have the Tomahawk Nuclear Land Attack Missile (TLAM/N) installed? On how many will they be installed by the end of fiscal year 1985?

Admiral HOSTETTLER. The surface ships which are currently nuclear certified and Tomahawk TLAM/N capable [deleted]. By the end of fiscal year 1985, it is planned that the [deleted] will also be TLAM/N capable.

E-6A

Senator LEVIN. Is the Navy finally in full agreement on the E-6A as the replacement for the EC-130 TACAMO aircraft? Will the Navy in fact have the funding room in the out-years to carry this program to fruition?

Admiral LAYMAN. The Navy is in full agreement on the E-6A as the replacement for the EC-130 TACAMO aircraft. Funding flexibility in the out-years to carry the program to fruition currently exists and is dependent upon favorable congressional action on subsequent budget submissions.

NUMBER OF TRIDENTS

Senator LEVIN. You describe in a rather casual fashion the Navy's plan "to support an all Trident force of about 20 ships by the end of the century" and add that the exact number has not yet been determined. Since you are asking for #13, and for long lead for #14 and #15 this year, will we hear from you in more definitive terms in the next year or so?

Commodore BACON. Setting a Trident force level in the near future is neither necessary nor desirable. Because each Trident submarine is very expensive, our building rate is only one per year. At that rate advance funding for the 21st Trident would not be requested until fiscal year 1992. Between now and then, several factors—future arms control agreements, the composition of other legs of our strategic Triad, and changes in the Soviet target base—will influence the force size decision.

RELIANCE ON SEA-BASED DETERRENCE

Senator LEVIN. "Twenty Tridents" by the end of the century strikes me as a lot smaller force, in terms of ships, in terms of launch tubes, and in terms of RVs than we have in our force today. Would you give us that comparison, please, and can you explain why the reliance on sea-based deterrence will decrease by the end of the century?

Commodore BACON. Reliance on our sea-based deterrent forces will not decrease by the end of the century. The Trident submarine force is being built to replace our aging Poseidon SSBN force. The last Poseidon is due to be decommissioned [deleted]. The Poseidon force of 31 ships carries 496 launchers, while a Trident force of twenty ships carries 480 launchers. There are [deleted] RVs in the Poseidon submarine force. As we currently plan to load a force of 20 Trident SSBNs, they will carry [deleted] RVs which will be dramatically more effective than today's Poseidon force against the ever-hardening Soviet target base. Further, the Trident submarines will spend a greater portion of their life cylce at sea than the Poseidons.

Senator LEVIN. Are you assuming the SDI will have reduced the value of the ballistic missile by then?

Commodore BACON. Because the nature, effectiveness, and availability date for an operational SDI cannot be predicted at this time, our analysis of strategic forces does not include any assumptions concerning future SDI capabilities.

SDI AND THE NUMBER OF TRIDENT SUBMARINES

Senator LEVIN. In light of the prospects for the Soviets to develop an SDI, would the Navy consider deploying more than 20 Trident submarines so as to proliferate the number of missiles and warheads which might be available to try to break through Soviet missile defenses?

Commodore BACON. The nature and specifics of a Soviet SDI will have to be better known before a decision on an appropriate counter can be reached. The Navy is investigating various technical countermeasures to reduce the effectiveness of potential Soviet SDI technologies. While it is unlikely that increasing the number of Trident submarines would in itself constitute an effective counter to a Soviet SDI, the size of the ultimate Trident force requires a national-level, vice Navy, decision.

SDI THREATS

Senator LEVIN. Provide for the record a detailed description of the Navy's program to study ways to defeat Soviet SDI threats, including all the possible methods being considered as countermeasures to a Soviet SDI?

Admiral CLARK. Historically, the Strategic Systems Program Office, which has life cycle responsiblities for the FBM program, has conducted an ongoing low level R&D program, the Vulnerability and Effectiveness (V&E) program, which has monitored all SLBM in-flight threats (launch to impact). With the evolution of SDI this program monitors the potential enemy SDI-type threats based on technical intelligence information and the U.S. SDI developments. Lacking a defined threat, the V&E program postulates the full spectrum of possible threat technologies and how they might be incorporated into defensive weapon systems, assesses the possible impact of such systems on SLBM effectiveness, and postulates potential countermeasures to reduce vulnerability to such defenses should these threats materialize. [Deleted.] We

continually update our assessments to reflect changed intelligence information, new test results, technology advances, and new threat systems concepts. In view of the rapid developments in the kinetic and directed energy (K&DE) weapon threat area under the aegis of the SDI program, we have begun efforts to catalog the characteristics of K&DE weapons which may in the future threaten our SLBM systems, and to generate a more comprehensive data base on the vulnerability of missile body components to such weapons. Through these V&E program efforts we intend to insure against technological surprise and to be prepared to react in a timely manner, as necessary, to emerging enemy threats which would require a U.S. response.

SSBN MODERNIZATION

Senator LEVIN. On page 4 of his statement to our Seapower Subcommittee, Navy Submarine Warfare Chief, Vice Admiral Thunman refers to modest funding being requested in fiscal year 1986 to modernize our strategic submarines by improving their communications and their quieting/acoustic characteristics. Please provide details for the record as to how much money in which programs, what the money will be used for specifically in fiscal year 1986, how much is in the fiscal year 1986–90 program for these efforts, what are the long-term goals of each program and how much closer to achieving them we will come if the fiscal year 1986 request is approved.

Commodore LEWIN. The funding requested refers to the following three modernization program elements. The long term goals of two are intended to maintain Poseidon and Trident SSBN communication capabilities current with other DOD programs and to improve the ability of the operational command authorities to communicate with strategic submarines. The third is intended to enhance SSBN survivability by continuing our ship silencing program.

1. SSBN communications equipment support

We are modernizing and upgrading communication capabilities of the Poseidon strategic submarines under Program Element 11221, Fleet Ballistic Missile System, Line Item 33313000, Submarine Communication Antennas. This effort procures improved towed buoy antennas and test equipment and intergrates mandatory cryptological and communication upgrades into the Poseidon radio room.

Fiscal year 1986 effort [OPN]

[In millions of dollars]

Project	*Funds*
OE–305 Towed buoy antenna	1.7
CU–1441 multicoupler mod	.7
OE–158 GPS mod kit	.2
VLF spectrum analyzer	.5
AN/UGV–136 printer	.8
AS–3434 ELF floating wire antenna	1.9
Total	5.8

Fiscal year 1986–90 program

[In millions of dollars]

Sub communication antennas:	
1986	5.8
1987	5.4
1988	12.5
1989	14.0
1990	8.8

2. Trident communications systems

This program provides funds to integrate mandatory cryptological and communication systems upgrades developed by other DOD programs into the Trident Integrated Radio Room [IRR] under program element 11228, Trident I; Line Items 510000400, Project S0004, Trident Submarine (RDT&E); and 33267600, Strategic Platform Support Equipment [OPN]. The RDT&E effort integrates the equipment into the IRR and the OPN effort procures the ancillary components to support installation.

FISCAL YEAR 1986 EFFORT (FUNDS)

[In millions of dollars]

Project	RDT&E	OPN	IOC
Enhanced VERDIN Crypto System	0.4	3.5	September 1986.
ELF integration	1.3	3.0	March 1990.
Universal towed buoy antenna	.2	.9	March 1989.
Towed buoy electric winch drive	.1	1.3	Do.
K2–51 (RACE) offline Crypto	.1	.1	July 1988.
KWR–46 (VALOR) online Crypto	.2	.1	Do.
Total	2.3	8.9	

FISCAL YEAR 1986–90 PROGRAM

[In millions of dollars]

Trident sub (RDT&E)	2.3	3.6	6.7	11.3	7.5
Strat. plat supp (OPN)	8.9	8.9	40.6	32.4	11.2
Total	11.2	12.5	47.3	43.7	18.7

This continuing effort is essential to meet the initial operating capability (IOC) of these and future communication upgrades. Without this effort, Trident submarines will not be compatible with other DOD communication systems.

3. Silencing

a. Poseidon SSBN: Improvements in quieting of Poseidon SSBN's are funded under Program Element 11221, Fleet Ballistic Missile System, Line Item 33094000.

Fiscal year 1986 effort (OPN)

[In millions of dollars]

Project	*Funds*
Electrical system harmonic noise reduction	5.1
Noise vibration monitoring system	1.2
Air reducers	.2
Data acquisition equipment	.5
Acoustic trial equipment	.5
Pump modifications	1.0
Auxilliary system valves	.5
Vent fan mode	.5
Production engineering	.1
Total	9.6

[In fiscal years]

Silencing:	
1986	9.6
1987	12.2
1988	15.7
1989	19.1
1990	22.5

b. Trident SSBN: Improvements in Trident noise characteristics are funded under Program Element 11228, Line Item 510000400, Project S0004, Trident Submarine. This project develops improved quieter valves and reducers, [deleted].

Fiscal year 1986 effort (RDT&E)

[In millions of dollars]

Project	*Funds*
Acoustic improvements	0.3
[Deleted]	1.0

Project	*Funds*
[Deleted]	.6
[Deleted]	.4
total	2.3

[In fiscal years]

Silencing efforts:	
1986	2.3
1987	7.2
1988	7.5
1989	7.4
1990	4.7

The long term goal of these silencing programs is to maintain the Poseidon and Trident acoustic signatures at low levels to ensure continued survivability by avoiding detection. The fiscal year 1986 funds are essential to continuing this vital program.

MINUTEMAN DISMANTLEMENT

Senator LEVIN. In your testimony, you describe the survivability of our submarines in glowing terms, yet in the section dealing with continued SALT compliance, you tell us "Although we have planned and funded overhauls for the affected Poseidon submarines, we have also protected the option to dismantle them if required." We have the option to retire Poseidon submarines or dismantle Minuteman III missiles to remain within the ceilings. Does your statement imply that, if the administration decides to remain within the ceilings, dismantling Minuteman silos has been ruled out?

Commodore BACON. No dismantlement option for continued compliance with current arms control policy has been selected to the exclusion of any other options. Specifically, the dismantlement of Minuteman silos has not been ruled out.

Senator LEVIN. Do you know whether the Air Force has been directed to fence funds for dismantling 14 MM-III silos?

Commodore BACON. To my knowledge, the Air Force has not been directed to fence funds for the dismantlement of 14 Minuteman III silos.

DISMANTLEMENT/OVERHAUL COSTS

Senator LEVIN. Please compare the cost of dismantling Poseidon submarines to comply with SALT limits to the cost of overhauling them as scheduled to retain them in service.

Commodore LEWIN. Representative costs to overhaul and dismantle an SSBN in fiscal year 1986 are:

[In millions of dollars]

Overhaul	$177.0
Dismantle	18.4

USE OF DISMANTLED POSEIDONS

Senator LEVIN. For what mission does the Navy intend to use the Poseidon submarines scheduled either for overhaul or dismantlement this summer.

Commodore LEWIN. If national policy remains to "not undercut SALT" when *Alaska* (SSBN 732) commences her sea trials in mid-September, the Navy has planned for dismantling a Poseidon SSBN as compensation. Various alternatives are under consideration to utilize this and any follow-on dismantled SSBNs.

The first suitable SSBN will be converted for use in the Naval Nuclear Propulsion Program for "hands on" training of operators in the practical aspects of naval nuclear propulsion plant operation. Dismantled SSBNs not used for alternate disposal. Overhauled SSBNs will continue to operate in their strategic deterrent role.

ALASKA AND SALT LIMITS

Senator LEVIN. On what exact date will the Trident submarine *Alaska* begin sea trials and what are the specific implications of that for the relevant SALT I and SALT II limits?

Commodore BACON. The U.S.S. *Alaska* is expected to begin initial sea trials on 17 September 1985. Without some form of compensation prior to that date, the United

States will then exceed the SALT I interim agreement SLBM launcher limit by 22 launchers and the SALT II MIRV missile limit by 14.

POSEIDON DISMANTLEMENT

Senator LEVIN. What is the latest date by when a decision can and must be made to dismantle the launch tubes on the candidate Poseidon submarine and still meet the SALT requirements when the *Alaska* begins her sea trials?

Commodore LEWIN. Approximately one month's notice is required prior to *Alaska's* sea trials in order to off-load missiles and comply with SALT dismantlement procedural requirements.

TRIDENT II (D-5) BACKFIT OPTIONS

Senator LEVIN. What options are available for accelerating the overhauls of the first eight Trident submarines to upgrade them with Trident II missiles? By how many years could we accelerate these overhauls and when could we begin this process?

Commodore LEWIN. The Navy does not envision a need for an accelerated backfit of the Trident II (D-5) missile into the first eight Trident submarines, as long as the Soviet threat develops as we now project and the President's Strategic Modernization Program proceeds as planned. An unanticipated change in the nature of the Soviet target base or in the modernization of the other legs of the U.S. strategic triad could require a national decision to ask for more capability sooner from our sea-based deterrent force.

The plan as it now exists is to backfit during the regularly scheduled overhaul, which occurs at about the nine year point in the ship's life. The first ship's overhaul is scheduled to start in 1991. If required and if assets were made available, we could start the first backfit in fiscal year 1990 and proceed at a faster rate than currently planned. All backfits could then be completed by 1995 vice 1998.

SOVIET ASW DEVELOPMENT

Senator LEVIN. Back in 1979 Dr. Perry, who was then the Under Secretary of Defense, told this subcommittee that he did not project the Soviets would be able to develop a system to localize our SSBNs during the decade of the 1980's. Dr. David Mann, who as the Assistant Secretary of the Navy for Research and Engineering, agreed with Dr. Perry's assessment of the Soviet ASW development and even went further by stating: "Yes, I agree with it, provided there is no implication that in the 1990's that they will develop such a capability."

When I asked Dr. Mann, "No earlier than the 1990's?" he responded "No earlier than that, yes."

Have there been any developments in the Soviet threat to our missile submarines to change this assessment?

Commodore LEWIN. Since Drs. Perry and Mann testified before your subcommittee in 1979, there have been no significant changes in the Soviet capability to localize our stategic submarines. The Soviets have continued to pursue an agressive ASW research program, but the incremental improvements we have observed will be incapable of localizing strategic submarines on patrol for at least the next decade.

SSBN SECURITY

Senator LEVIN. Each year I ask the Navy's top admirals, the chief of Naval Operations, assistant secretaries, and everybody else I can get my hands on the following question: "Since your appearance before the committee last year, has there been any change in the Soviet threat to our strategic ballistic missile submarines in terms of greatly improved Soviet anti-submarine warfare capabilities?"

Commodore LEWIN. We continue to believe that Soviet forces are not now an effective counter to U.S. SSBN's and that at least through the next decade virtually all SSBN's on patrol would be fully survivable and able to launch their missiles. The longer range of the Trident missiles provides [deleted] increase in available patrol areas, greatly complicating anti-submarine warfare efforts. The Trident submarine also incorporates significant quieting improvements and increased quiet patrol speeds to reduce detection and complicate search. The larger Trident submarine also permits installation of advanced countermeasures equipment should potential threats become identified. Advances incorporated into Trident weapons system provide increased flexibility [deleted]. It will become increasingly important for our submarines to operate at unrestricted speeds and depths as advanced sensors are

deployed. Our SSBN Security Program and the improvements in survivability we have put into our submarines and weapons systems are expected to provide sufficient and flexible response to future threats which might develop from Soviet research and provide for continued survivability of our SSBN force.

Senator LEVIN. Does the Navy still consider our missile submarines to be invulnerable against the Soviet threat at the present time, and does the Navy still expect that the submarines shall still remain invulnerable against the Soviet ASW threat at least until the end of this decade?

Commodore LEWIN. The Navy considers our SSBN force to be invulnerable to the present Soviet ASW threat and that it will remain so in the foreseeable future, even well beyond the end of the decade. Our SSBN Security Program examines present and postulated future technologies in ASW and develops countermeasures and tactics to counter potential threats. This program gives us the confidence to predict the continued survivability of our SSBN force well into the future.

Senator LEVIN. In February 1981, in response to my question, the CNO responded: "There has been no change in our assessment of the Soviet threat to our strategic missile submarines. We continue to believe that the Soviet anti-submarine warfare (ASW) forces are not now an effective counter to U.S. SSBNs. We believe that Soviet ASW capabilities will improve, but that introduction of the Trident missile and Trident submarine with the corresponding expanded operating areas and improved acoustic quieting will provide continued survivability. We believe the Soviets have little prospect of developing new systems capable of effectively detecting and tracking U.S. submarines in broad ocean areas in the foreseeable future." Do you agree with that statement?

Commodore LEWIN. There has been no change in our assessment of the Soviet threat to our SSBNs. We continue to believe that Soviet ASW forces are not now an effective counter to U.S. SSBNs, nor will they be in the foreseeable future. This assessment is based on the continuing development and deployment of improved systems, and on countinuing evaluation of current and future ASW technologies and tactics.

Senator LEVIN. In 1981, Admiral Carter, Head of the Navy's Strategic and Theater Nuclear Warfare Division, testified that: "Anti-Submarine warfare is a war of attrition. Given a capability it takes time, weeks or months, to detect and localize any significant portion of a submarine force."

I then asked him: "Would you agree that despite the expenditure of billions of dollars or rubles that the Russians have made in past decades to improve their ASW capabilities they have failed to develop such a detection and localization capability to successfully attack and destroy our strategic missile submarines?"

He responded: "Yes, sir. I would agree that is true."

Would you agree that this is still true?

Commodore LEWIN. Yes, sir, that is still true. We believe that Soviet ASW forces will continue to grow in capability. [Deleted]. As we look forward, we should expect to see increased Soviet ASW effort. Historically, the more forces devoted to ASW, the more effective the capability. The continued increase in Soviet ASW forces will undoubtedly result in some overall improvement in ASW capability. Our SSBN Security Program and the improvements in survivability we have put into our submarines and weapons systems are expected to provide sufficient response to future threats and provide for continued confidence in the survivability of our SSBN force.

Senator LEVIN. Do your statements that you have just made or agreed to about Soviet efforts to detect and destroy our strategic missile submarines apply both to Soviet efforts in acoustic and non-acoustic ASW detection?

Commodore LEWIN. Yes, we believe that for the foreseeable future the Soviets have little prospect of developing new systems capable of effectively detecting and tracking U.S. submarines in broad ocean areas. Our SSBN security program has placed special emphasis on investigating current and future non-acoustic and acoustic detection technologies. This effort has involved some of the best physicists in the country. Their evaluation of these technologies shows no currently foreseen "breakthrough" which will make our patrolling SSBN's vulnerable to detection and attack.

Senator LEVIN. Our Navy believes our strategic ballistic missile submarine force "is essentially invulnerable today and will remain so for the forseeable future," according to Admiral Holland, its strategic warfare chief. In fact, the Admiral's statement continues "indeed, to my knowledge, there has been no responsible, serious challenge made to this view. We are confident that the Trident systems will continue to provide this invulnerable element over the life of the systems."

Since the service life for the Trident system is at least 30 years, would you agree that our strategic missile submarine force will remain "still survivable and highly capable," as Secretary Weinberger said, for at least the next 30 years?

Commodore LEWIN. We continue to believe that the Soviet ASW forces are not now an effective counter to U.S. SSBNs. However, it is difficult for us to predict the technologies the Soviets will employ in their on-going ASW efforts. For that reason we have developed countermeasures for ASW techniques even though there is no evidence that the Soviets have employed these techniques. [Deleted.] We believe that such efforts will keep our Tridents fully survivable and highly capable for the next 30 years.

Senator LEVIN. Is it fair to say that we are considerably better at ASW than the Russians? Even though we are much better at ASW than the Soviets, we find it extremely difficult to detect our own strategic ballistic missile submarines under normal patrol circumstances, and especially when our SSBNs try to evade our own ASW forces, is that not so? There actually have been very few detections by our own forces of our own SSBNs under normal conditions, is that not so?

Commodore LEWIN. [Deleted.]

UNITED STATES VERSUS SOVIET SONARS

Senator LEVIN. Are not the U.S. SSBN/SSN sonar systems more capable than Soviet sonars? Are not Soviet submarine noise levels, acoustic signatures, higher than those of U.S. SSBN's? Do not these two factors provide U.S. submarines a significant relative advantage over Soviet submarines? Please provide relative data to compare in these areas.

Commodore LEWIN. We believe that current U.S. submarine passive sonars are significantly superior to Soviet sonars. Also, current U.S. submarines are significantly quieter than Soviet submarines. These two factors provide a relative acoustic advantage to U.S. submarines [deleted] depending on a variety of operational and environmental conditions. [Deleted]. Continuing high priority U.S. efforts in both quieting and sonar development will be necessary to maintain a U.S. acoustic advantage.

SSBN SILENCING

Senator LEVIN. Is it not true that DOD/Navy has many programs underway to enhance SSBN survivability, such as deveolping methods for reducing SSBN detection, including conducting a noise reduction program to lower SSBN generated noise? Is it not true that SSBN generated noise of the existing fleet has been or is being reduced?

Commodore LEWIN. The Navy has an active and on-going effort to enhance SSBN survivability. This effort includes:

a. An active research program to identify possible future threats to SSBN detectability so that operational or engineering fixes can be effected even before the threat actually exists.

b. [Deleted.] Identified noise offenders are corrected on a priority basis.

c. Various ship alterations in the Fleet Modernization Program which corrected noisy equipment designs or installations and contributed to lowering of the overall acoustic signature.

d. [Deleted.]

e. [Deleted.]

As a result of these efforts, SSBN generated noise level has been and continues to be reduced.

SSBN SECURITY

Senator LEVIN. Five years ago I asked Dr. Perry about Soviet capabilities to simultaneously attack all our SSBNs on patrol. I stated that for such a threat to mean anything as far as degrading the nuclear deterrent of our SSBNs, the Soviets would have to be able to strike them all at once. Dr. Perry responded:

"Basically what you say is correct, it would have to be a simultaneous attack on the submarines for the Soviets to have any confidence in the success of their attack.

"I do not want to dramatize this point and suggest that they have this capability or that it would be easy for them to achieve it. It is an enormously difficult technical problem even to detect one submarine at sea, much less detect the whole fleet, discriminate the submarines from all the other things in the area and have high confidence in an attack. This is an extraordinarily difficult task."

Would you agree?

Commodore LEWIN. Yes, sir. I agree. Dr. Perry's hypothetical example assumed [deleted] U.S. SSBNs were at sea, that all [deleted] SSBNs could be simultaneously located [deleted] and that Soviet ICBM's [deleted]. Based on these assumptions, Dr.

Perry calculated that [deleted] warheads would be required to destroy the [deleted] SSBNs at sea. This hypothesis assumes employment of the Soviet ICBM force against U.S. SSBNs [deleted]. Note that the assumption is based on simultaneous location of all U.S. SSBNs at sea [deleted]. This hypothesis also rapidly degrades such that if location accuracy of [deleted] warheads becomes required which, as Dr. Perry testified, would make such an attack totally infeasible.

Senator LEVIN. I continued: "How much warning would we have if they proceeded on that path?" He said: "It depends very much on how they would proceed, but in all of the ways I can think of now that you would proceed on that problem it would be a very visible program."

Commodore, would you agree it would be a "visible program," thus giving us years of warning time? We would have this warning as to the extent to which they might be achieving that capability, would we not?

Commodore LEWIN. Yes sir, it would be visible. For the Soviets to be able to mount such an attack, they would have to develop the capability to simultaneously locate and track all of our patrolling SSBNs. We believe that we would have ample warning of such a major ASW breakthrough should it occur.

Senator LEVIN. Dr. Perry in part described the increased Soviet ASW problem caused by our SSBN's now deploying with longer-range Trident missiles.

"Moreover, that ocean area that they have to search, instead of being close to the Soviet Union and therefore accessible, for example, to airplane patrols and antisubmarine surface ships, is now located in areas of the Atlantic and Pacific such that it would be extraordinarily difficult for them to deploy their resources to these areas. This is therefore an enormous improvement. I would say it is easily an order of magnitude, that is a factor of ten, increase in difficulty for whatever antisubmarine warfare program the Soviets have."

You would agree with this as still being true, despite passage of three years?

This difficulty is even worse when the even longer range Trident II comes on line, is it not?

Commodore LEWIN. Yes, sir. It is true that the longer range of the Trident missiles complicates the Soviet's ASW problem enormously. When fully loaded, with the larger warhead currently planned, the Trident II missile range will be comparable to that of the Trident I missile.

UNITED STATES VERSUS SOVIET ASW

Senator LEVIN. What are the documented results of U.S. anti-submarine warfare activities against our own assets? If we, with our much better systems, have problems detecting our own SSBNs as was stated before the Subcommittees, why do we think the Soviets are or would be successful?

Commodore LEWIN. The SSBN security program runs a series of security exercises every year. [Deleted.] Thus we do not think that the Soviets would be successful in any attempt to locate our patrolling SSBNs.

SSBN SECURITY

Senator LEVIN. Three years ago, I asked Admiral Griffiths, then DCNO, Submarine Warfare, the following: "What is your assessment of SSBN vulnerability in the late 1980's and 1990's? Is there any reason to be cautious in deploying the Trident II missile because of growing vulnerability of the SSBN force?

He answered: "We continue to concur with the assessment which concludes that Soviet forces are not now an effective counter to U.S. SSBNs and that at least through the next decade virtually all SSBNs on patrol would be able to launch their missiles."

Do you agree his answer still is true?

Commodore LEWIN. Yes, sir.

SOVIET ASW EFFORTS

Senator LEVIN. Admiral Griffiths in 1980 testified that it is extremely difficult for even the U.S. Navy, which has a far better capability (that I think everybody acknowledges) in ASW than does the Soviet Union to detect our strategic missile submarines, even when they deploy existing communications such as towed buoy antenna and the floating wire antenna. Admiral Griffiths stated that even with the floating wire antenna the success rate of the U.S. ASW forces is extremely small.

I asked the Navy's top submarine admirals in 1981, "Whether you would agree that these statements remain true today despite the passage of another year?" Both

answers were: Admiral Carter: "Yes; I would agree with that"; Admiral Kelso: "Yes, sir, I would agree with that."

Two years later, do these statements and your agreement with them remain the same?

Commodore LEWIN. These statements remain true and I fully support them.

SSBN DETECTION

Senator LEVIN. Please provide for the record the number of US/allied and Soviet detections of the U.S. SSBN's during the past five years, by year, compared with the number of annual patrol days. Describe whether the detections were accidental and at random, or could be attributed to any U.S. SSBN deficiency or Soviet ASW capability.

Commodore LEWIN. [Deleted].

Year:	*Detections*
1980	[Deleted]
1981	[Deleted]
1982	[Deleted]
1983	[Deleted]
1984	[Deleted]

SSBN SECURITY

Senator LEVIN. There have been several reports in the news media in the past 6-8 months regarding supposed Soviet breakthroughs and research in anti-submarine warfare. On August 10, 1984 the Baltimore News American reported that an Air Force source made claims about the Soviets use of satellite based synthetic aperture radars to detect submarines. A similar article was printed in the Washington Times on August 16, 1984. Does the Navy agree with these claims?

Commodore LEWIN. No sir, we do not agree. The articles claim that the Soviets have successfully detected SSBNs in broad ocean areas using a satellite based synthetic aperture radar (SAR) and will soon have a fully operational system. [Deleted.]

The Washington Times article also made reference to certain Defense Intelligence Agency, U.S. Air Force Intelligence Agency and National Security Agency reports that the Soviets have successfully tracked SSBNs from a manned space station and from special aircraft using SAR. [Deleted].

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Commodore LEWIN. No, sir, we do not agree. The articles claim that the Soviets have successfully detected SSBNs in broad ocean areas using a satellite based synthetic aperture radar (SAR) and will soon have a fully operational system.

(Deleted.]

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[Whereupon, at 12:30 p.m., the subcommittee recessed subject to the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1986

MONDAY, MARCH 11, 1985

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

STRATEGIC COMMAND, CONTROL AND COMMUNICATIONS

The subcommittee met in open session, pursuant to notice, at 10:12 a.m., in room SR-222, Russell Senate Office Building, Senator Strom Thurmond presiding.

Present: Senators Thurmond, Wilson, Hart, and Glenn.

Staff present: Robert F. Bott, Douglas R. Graham, William E. Hoehn, Jr., George K. Johnson, Jr., professional staff members; and Karen A. Love. staff assistant.

Also present: Romie L. Brownlee, assistant to Senator Warner; Henry D. Sokolsi, assistant to Senator Quayle; Mark J. Albrecht, assistant to Senator Wilson; Allan Cameron, assistant to Senator Denton; Janne P. Nolan, assistant to Senator Hart; Jeffrey B. Subko, assistant to Senator Exon; and Phillip P. Upschulte, assistant to Senator Glenn.

OPENING STATEMENT BY SENATOR STROM THURMOND, PRESIDING

Senator THURMOND. The subcommittee will come to order.

Senator Warner, chairman of the Strategic Subcommittee, is in Geneva and I am chairing today's hearing.

This morning we convene in open session to hear testimony in support of the fiscal year 1986 request for strategic command, control, communications and warning systems. This area was identified by the President as his top priority in the five-part strategic modernization program announced in October 1981. It was a top priority of this committee even before the President's initiative.

I want to extend a very warm welcome to our witness this morning. He is Mr. Donald C. Latham, the Assistant Secretary of Defense for Command, Control, Communications and Intelligence, a position that was directed to be established by the Congress in the DOD Authorization Act of 1984.

The committee has just recently been advised that all C^3 and intelligence policy functions have been consolidated under this position as well, a very positive development.

The testimony this morning will provide the record by which members of this committee can make recommendations on the strategic C^3 request, which totals $5.2 billion this year, an increase of about 20 percent over last year.

Mr. Latham has made his very informative statement available to the subcommitee in advance. In it, he describes in considerable detail the three key strategic C^3 areas that are required to support our deterrent policy, and if deterrence fails, to execute the decisions of the National Command Authorities.

These are attack warning and attack assessment, both of missile and air breathing attacks, command decisionmaking, and communications.

Mr. Latham, the subcommittee looks forward to your detailed testimony on these most important programs. You may proceed in any way you see fit.

We are in open session now, and it is the intent of the Chair to close the hearing whenever you deem it necessary for the presentation of classified material.

I have some questions for you that I will defer until after your presentation.

We are very pleased to have you with us.

STATEMENT OF HON. DONALD C. LATHAM, ASSISTANT SECRETARY OF DEFENSE, COMMAND, CONTROL, COMMUNICATIONS AND INTELLIGENCE

Mr. LATHAM. Thank you very much, sir. It is a pleasure to be here.

As you mentioned, I have a prepared statement for the record that I ask you to insert in the record.

If I may, sir, I would like to use some viewgraphs to illustrate the program we are undertaking in the budget request. In order to do that, however, because of the extremely sensitive nature of several of the pieces of information, we really need to go closed, sir, from the very beginning. We need to go in closed session in order for me to make a presentation.

Senator THURMOND. Will the counsel please clear the room.

Are you going to have an open session following the closed session?

Mr. LATHAM. I think in order to do the questions and answers, we probably will have to keep it closed all the way.

Senator THURMOND. This will be a closed session during the entire morning. I regret that those who have come cannot stay, but I am sure you understand.

[Whereupon, at 10:14 a.m., the subcommittee proceeded in executive session.]

EXECUTIVE SESSION

Mr. LATHAM. What I would like to cover today is noted on the discussion outline. I would like to discuss how I see the trends in national defense. I would like to introduce to you some work we are doing in the crisis control area.

DISCUSSION OUTLINE

Long term trends in national defense.
The disinvestment problem.
A net assessment: Soviet vs U.S.
Crisis control.
The nuclear weapons master plan.
Strategic c^3 initiatives.
The fiscal story.
An assessment.

Further, I will summarize for you the strategic C^3 initiatives and show you what we have accomplished so far.

Lastly, I will show you our budget request and give you an assessment of the long-term trends in national defense which are summarized here.

LONG-TERM TRENDS IN NATIONAL DEFENSE

Continued Soviet military momentum:—technology, Soviet SDI,—weapons development and production, space.
Coping with future budget realities:—past disinvestment,—how much real growth.
Continue strategic modernization program.
Conventional and TNF modernization emphasized, interdiction attack.
Strategic defense priority:—air, space, ballistic.
Impact of arms control?

The important point is that there is a Soviet SDI program. You read a lot about ours, but never hear about theirs.

In the area of high energy lasers for space application, the Soviet programs are assessed [deleted] the size of our program. We often forget that they are moving very rapidly at a pace far faster than we have.

We are going to have to cope with future budget realities in the Defense Department. I know my request this year is 19½ percent up from fiscal year 1985 and that is quite heavy, but I believe we can justify such growth.

Next I think, as you mentioned, the President when he announced the Strategic Modernization Program put the C^3I part of it at the very top. We are continuing to march ahead on that.

I see our continuing the modernization of the program as we continue through the next 5-year defense period. Without forgetting our conventional and theater nuclear forces, we are modernizing those as well and particularly on the conventional side the interdiction program is receiving very heavy support.

In this year [deleted] the budget for interdiction was pegged at around [deleted]. This will make a major improvement in our conventional capability as we bring some of this newer technology to bear.

Lastly, and I will talk to this in more detail in that our strategic defense actually encompasses air defense, space defense, and ballistic missile defense. What you read every day in the paper about SDI is only the ballistic missile defense piece of it.

I want to show you how we approach it with an integrated defense effort. The impact of arms control on all of this is also considered. Our friends in Geneva will be working on that as we progress over the next several months. Let me talk to you about crisis control and what we are doing there.

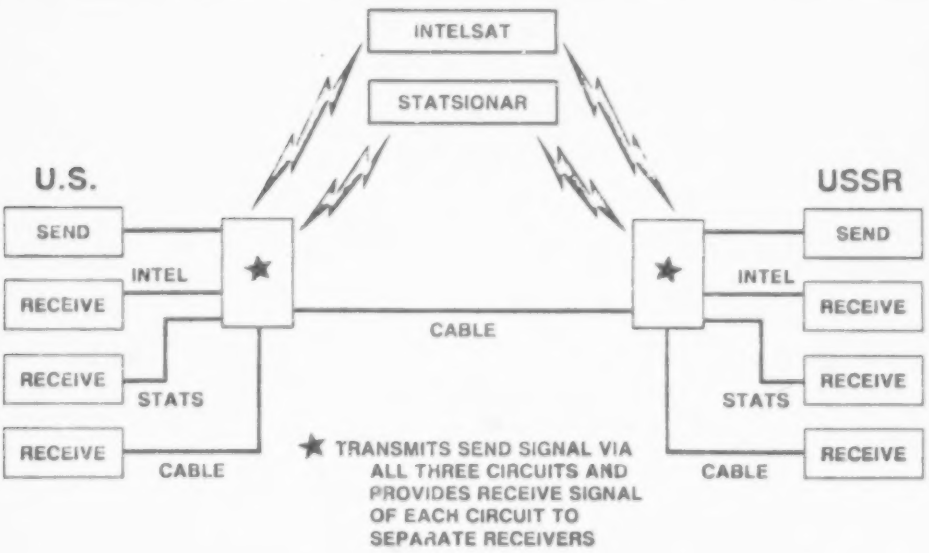
First of all, we are [deleted] and I will show you some pictures of what we are doing there.

We are upgrading the so-called Washington-Moscow hotline to include not only teletype data, but facsimile transmissions. It is data and facsimile transmission that will give us a more robust capability to communicate back and forth.

We have a [deleted] as you are aware. The background on crisis control goes back into the 1982 time frame [deleted]. In fact, we will expand on that.

[Deleted.]

DIRECT COMMUNICATIONS LINK (DCL)
WASHINGTON - MOSCOW



Let me switch to the hotline area. We are upgrading the hotline between Moscow and Washington and setting it up so that transmission goes through two different satellites, a Soviet satellite and then it goes through a U.S. communications satellite. Also, we will use underwater cable across the Atlantic.

Back at the U.S.S.R. there are three different receive capabilities here, the third one being by cable and similar situation over here on the U.S. side.

So, we will have data and facsimile capability over these three paths capable of 24 hours a day use, tested every hour or so, to make sure it works for crisis control between the two countries.

BACKGROUND

NCC OBJECTIVES

- JOINT INDUSTRY AND GOVERNMENT TELECOMMUNICATIONS OPERATION
  - FOCAL POINT FOR NATIONAL SECURITY AND EMERGENCY PREPAREDNESS (NSEP) TELECOMMUNICATIONS REQUIREMENTS
    - ESTABLISHED TO EFFECT:
      - INITIATION
      - COORDINATION
      - RESTORATION
      - RECONSTITUTION

UNDER ALL CONDITIONS OF CRISIS AND EMERGENCY

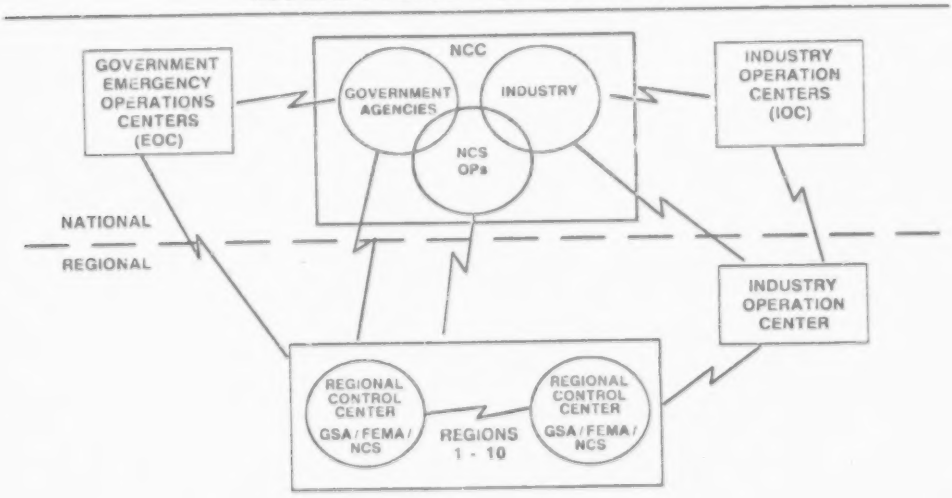
Now, with the divestiture of the telephone industry, the AT&T divestiture, we had to do something about our communications systems here in this country.

Over 90 percent of the command and control circuits are actually using commercial circuits. One of the major initiatives we undertook was to set up a joint industry-Government telecommunications coordinating capability called the national coordination center [NCC]. It will be the focal point for all national security and emergency preparedness telecommunication and it will establish a unique capability.

National Coordinating Center

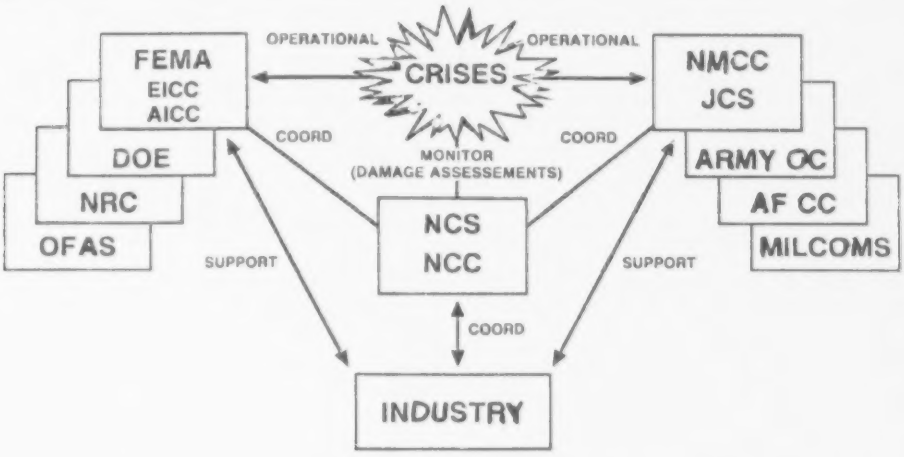
CURRENT STATUS

NCC BASIC CONCEPT OF OPERATIONS



We have this facility in operation today. It is connected to the Government operations center, industry operation centers and has a joint nature about it. We have provided offices to industry representatives who physically sit in their coordinating center offices 8 hours a day and are on call 24 hours a day. It is manned by DOD 24 hours a day.

NATIONAL COORDINATION CENTER
CONNECTIVITY



When there is not any kind of crisis, we have connectivity to all the various agencies and operations centers as noted here. Coordination with industry is effected so that we have a means for circuit restoration and coordination of the national telephone system through this national coordinating center.

It [the NCC] is established. It is physically located at the Defense Communications Agency on Courthouse Road near the Pentagon.

Let me now turn to the nuclear weapons master plan [NWMP]. This is an effort that has been underway for 3 years. What we did was take the U.S. strategic policy and we have rendered it in [deleted].

In effect, we have dissected this policy and then we have taken the logistics, the intelligence, the communications, the command and control and the forces and laid them against this policy to see how well we can support U.S. policy.

Let me give you one snapshot of the result. For the support required for [deleted] capability for command, control, and communications we have taken and looked at command centers, these types of things, we have looked at the intelligence, the logistics, the forces, and so on, to see whether or not we can satisfy the various requirements that have been laid out.

We look at what programs are funded as well as what things are unfunded. Every place there is an "x" we are meeting the requirement.

As noted again [deleted]. We also did the same thing with sensors. We looked at the various sensor systems.

Senator WILSON. What is core?

Mr. LATHAM. That is core requirements, basic fundamental requirements that you have to meet that are peculiar to the problem and then these are specific intelligence logistics and air defense and other requirements that we looked at.

There is a set of basic requirements that we have developed that are the following. [Deleted.]

We then develop the information needs he would have to have in order to function [deleted]. Against that core requirement we have looked at the intelligence support, logistics and air defense and other things to support the forces as well as the [deleted].

In each case we have taken a look at command centers, sensors and in the next case the communications system, again across the spectrum of conflict, what is funded and what isn't.

In our core program here, the basic core program, we are [deleted]. What is different between those?

[Deleted] and I will show you in 1 minute some pictures of some of the problems we are faced with in trying to [deleted] we don't know how to do that yet.

The master plan has been 3 years in being. We turned in a recent report to the [deleted].

[Chart deleted.]

Let me show you a view of how the Soviet command and control systems are put together and ours.

On the U.S. side we have [deleted].

What are we trying to do about that? We have lots of people giving us lots of advice. We have people from the intelligence community, the Air Force Science Board, an intelligence board, and the Strategic Air Command worrying about the problem. [Deleted.]

The Soviet Union, as you know, is extensive in area size as compared to the United States. It has land to [deleted] at least three times as compared to useable land in the United States.

[Chart deleted.]

Let me summarize what our C^3 system is. What is this system we are trying to make enduring and how does it work?

We have not talked about it, but there is a [deleted].

This is tested all the time.

There are major improvements being made here as well. This line represents communication to and from the forces, I will summarize those.

If you look now at what we are doing in this very important area, [deleted]. The way the system works is summarized here.

[Deleted.] That is also augmented by fixed sensor sites, radars, ballistic early warning radars and others.

We process that information and send it to NORAD. [Deleted.] There are, in fact, some unique capabilities here. Here is the NORAD command post. These are some of the communications systems we would use to bring that data to and from NORAD into these various users shown here.

[Deleted.] Finally what we do here is we have a [deleted]. By doing it this way we think it will be less costly than the prior architecture we had envisioned. Now let me summarize for you the major strategic initiatives. The money in the budget will buy [deleted] of those. We have enough nodes [deleted].

It is not a fancy system, [deleted].

We are putting in new receivers operating at [deleted] so that the bombers can be connected to the command authorities even under all kinds of electronic and nuclear effects.

We have in this budget a request for fiscal 1986 money for the E-6A. That is a replacement for the C-130 aircraft that we use today for the so-called TACAMO mission. We keep, in the Pacific and in the Atlantic, an aircraft [deleted] for connectivity to the submarines. These are new airplanes.

We are moving toward ELF as well. We have in production the transmitter sites and receiver systems. This will be fully operational, the entire system, by [deleted].

What the nuclear detection system [NDS] does for us, is that it allows the President and force commanders to know if a nuclear weapon is detonated anywhere on the surface of the Earth, that is above or on the surface of the Earth, the instant the weapon goes off.

Senator THURMOND. How many satellites do you use?

Mr. LATHAM. There will be 18 satellites in the operational system. There will be [deleted] on orbit. Because there are that many satellites and in the type of orbit we are putting them in, if you were standing anyplace on the surface of the Earth, you would be able to see at least [deleted] at any given time.

That being the case, then when a nuclear weapon goes off anyplace that weapon can be detected by at least [deleted] satellites. Because of the way we are doing it technically, we can [deleted].

This gives us a very important tool to know what damage has been done to our country as well as damage that could be done in another country. If there was an accidental nuclear explosion of some kind, this system would detect that and be able to relay that [deleted].

We have bought and are deploying [deleted] to work with the DSCS satellite.

We are taking a commercial initiative here called NETS. As I mentioned earlier, we are very dependent on the U.S. telephone system for command and control. Some 90 percent of our command and control traffic in the United States goes over the ordinary telephone.

NETS is a smart "Box" we put on switches in the telephone network. When we want to make a phone call from point A to point B, whereas today it may be by two or three paths, with NETS it will be by several hundred paths. By deployment of these switches, which is a very low cost initiative, we will have a much more robust telephone network in this country. It is underway now. We have tested this with Bell Labs and the AT&T people. We intend to deploy this in [deleted] immediately.

MAJOR STRATEGIC C^3 INITIATIVES

Command and control:—Four E4B NECAP.—Modernized WWABCC platforms. [Deleted.]—Hemp hardening of all critical nodes.—Special studies.

Related programs: SDA-2000:—Strategic defense initiatives (SDI).—North American Air Defense (NAAD).—Space defense.

In the command and control area we have delivered the fourth of the E-4B national command posts for the President. These are based in [deleted]. They are not at Andrews. We are modernizing

the platforms. We have, as I mentioned to you, a [deleted] program for the CINC's. We have hardened everything against high altitude EMP.

There are [deleted] studies underway to look at techniques for even greater survivability.

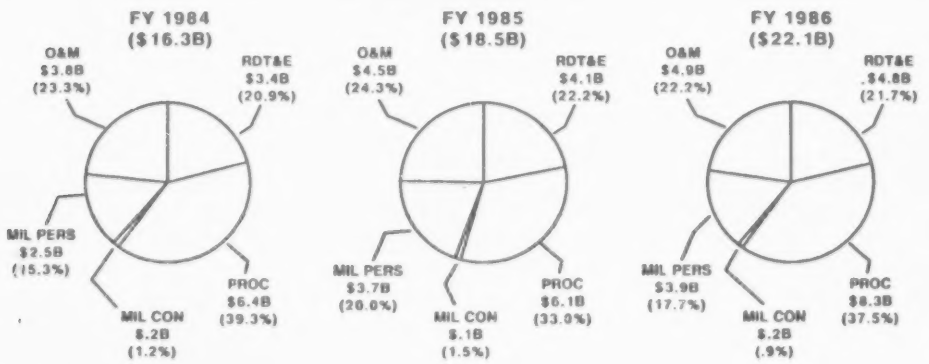
Now, this is a related strategic defense program, as I mentioned here. There is also the Strategic Defense Initiative, the North American Master Plan which has been submitted to Congress and there is a [deleted]. We look at these as integrated capabilities.

We thus have underway within the Department of Defense the SDA-2000 effort. Just to summarize for you where are the bad guys and where are we? We have no ABM launchers. He has a hundred. He has [deleted] interceptor aircraft. We have 300. He has 6,000 early warning radars. He has over 10,000 air-to-surface missiles on launchers to be deployed plus reloads.

We are taking a look at these three initiatives as as integrated approach to strategic defense. We are way ahead in the air defense area. We have a North American Defense Master Plan and we are going ahead with a number of initiatives in this area, a new set of radars, additional AWACS for air patrol, [deleted] and supporting programs called Milstar and DSCS, [deleted] and so on. We are looking at this as a total planning effort and not SDI in isolation.

Now, to get to the budget request. The point I would like to make about the C³I budget is that it is very much a joint cross service budget, about 65 percent of the DOD C³ budget is cross service or allied.

C³ RESOURCES
BY APPROPRIATION
(TOA - $ IN BILLIONS)



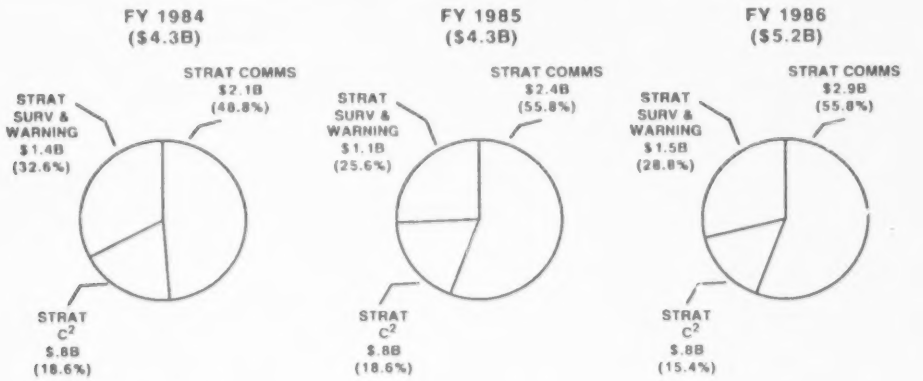
PRES.'s BUDGET
FEBRUARY 1985 DOD FYDP

If we look at our budget request for C³, $22.1 billion is what we are asking for, up from $18.5, of which procurement is the major increase, which is up to $8.3 billion in fiscal year 1986 from $6.1 billion in fiscal year 1985.

What we are seeing is that the R&D over the last 4 years is really starting to pay off, and we are starting to move into production for major systems, both tactical and strategic.

This is a very busy slide, but we are looking at around 24 percent or $5.2 billion in strategic accounts. That is holding about the same in terms of percentage of the budget. The budget is at $5.2 billion, up from $4.3 billion in 1985. We have roughly a 20-percent increase in C^3 in fiscal year 1986, a lot of that increase being procurement.

STRATEGIC C^3 RESOURCES
BY SUB-MISSION AREA
(TOA - $ IN BILLIONS)



PRESIDENT'S BUDGET
FEBRUARY 1985 DOD FYDP

If you look at it by submission areas, in the strategic side, strategic communications are around three billion of that $5.2 billion. The warning area is about a billion and a half and command and control is about eight-tenths of a billion dollars.

So, very heavy emphasis in the communications area.

Where the C^3 RDT&E went

Strategic C^3: *[In billions of dollars]*
fiscal years 1982-85

[Deleted].	
OTH-B	.3
TACAMO/E-6A	.3
DSCS	.2
NCMC	.2
ELF	.2
[Deleted].	

Theater and tactical C^3: *[In billions of dollars]*
fiscal years 1982-85

[Deleted].	
JTIDS	.7
TRI-TAC	.6
AWACS(E-3A)	.3
PLRS	.2
CIS	.2
TACS	.2
Hawkeye (E-2C)	.2

Now, you might ask what did you do with all that money over the last 4 years. I will summarize just R&D for you.

On the strategic side these are the programs that received the overwhelming bulk of the funding. Milstar, about [deleted] dollars. This is fiscal 1982 to 1985.

[Deleted] over the horizon radar, E-6A procurement, DSCS, national command and control system, North American air defense, PAVE PAWS radars are key programs.

On the tactical side, various types of communications systems, AWACS, $300 million, and so on. That is just R&D.

Where the C³ RDT&E went

Electronic combat:

	[In billions of dollars] fiscal years 1982–85
Self-protection	.6
Tactical EC countermeasures	.4
ASPJ	.3
Seek OXLE	.3
Shipboard EC improvements	.1
EF-111A	.1
[Deleted]	.5

Defense-wide C³:

	[In billions of dollars] fiscal years 1982–85
[Deleted].	
Long haul comm. (DCS)	.2
Supt. & base comm	.2

In electronic combat, there are various so-called electronic countermeasures, a very large effort in this area.

The defense-wide area is one of the major funding support items. In the secure communications area we are making a massive effort to secure this country by securing every telephone which needs protection.

A C³I Assessment

Priority recognized:—Defense guidance.—In NSDD's.
Excellent budget support:—Within DOD.—By Congress.
Modernization program defined/underway.
A survivable and enduring C³I system will:—Strengthen/stabilize deterrence.—Provide flexible escalation control.—Permit tradeoffs vs-a-vs added weapons.—Assist arms control initiatives.
However: the initiatives underway are:—Not all that simple.—Will take time.—Require sustained support.

Let me give you an assessment very quickly. I think our priority is recognized. It has been recognized in the Congress and defense guidance and in various national security decision directives. I think we have C³ in the right priority. I think we have had very excellent budget support within DOD and the Congress.

In fact, if you look at the budget history for C³ over the last 4 years, you have supported it exceptionally well, far better than the defense budget in general is supported.

I really think the congressional support has been excellent.

The modernization program for the forces and the C³I is defined and underway.

I think if we can, in fact, do what I have been talking about, build an enduring and survivable C³I system, we can strengthen and stabilize the deterrent, provide much more flexibility and

permit trade-offs, in fact, for weapons. If you have a smart and survivable C³I system, you can do a lot more with less. As a result, the C³I system will assist arms control initiatives.

I want to make sure you understand it takes a while to do all of this. It is not that simple. It is going to take time and continued support.

For example, we do not get the full Milstar capability until about [deleted]. It takes a long time to do some of these things.

I leave you two messages from the Soviet Union.

One, Mr. Brezhnev's comment in 1976.

ON SOVIET BEHAVIOR

"We may recall Lenin's words that in our society all is moral that serves the interest of building Communism."

L.I. Brezhnev, 1976 Report to the 25th Congress of the USSR Communist Party.

Mr. LATHAM. Finally, his timetable he articulated a few years later.

"Trust us comrades, for by 1985 . . . we will have achieved most of our objectives in Western Europe. We will have consolidated our postion. We will have improved our economy. And a decisive shift in the (balance) of forces will be such that come 1985, we will be able to exert our will wherever we need to."— Leonid Ilyich Brezhnev.

Thank you very much.

[The prepared statement of Mr. Latham follows:]

PREPARED STATEMENT BY DONALD C. LATHAM, ASSISTANT SECRETARY OF DEFENSE, (COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE)

I. INTRODUCTION

Mr. Chairman and Members of the Committee: Good morning gentlemen. It is my privilege to appear before you today to discuss a critical component of the President's Strategic Modernization Program—namely, Strategic Command, Control, and Communications, or C³. Effective strategic C³, as survivable as the forces they support, has been a priority of your subcommittee even before the President announced it as the highest priority in his strategic modernization program in October 1981. Without an adequate surviving and enduring C³ capability, our strategic forces, modern or old, strong or weak, with or without MX missiles and B-1 bombers, cannot be operated effectively. An improved C³ and associated intelligence capability as part of the mutually reinforcing elements of our strategic deterrent program will determine to a significant extent U.S. strategic capabilities and the strength of our deterrent posture into the next century.

My presentation today will highlight the very substantial progress we have made in implementing the C³ portion of the Strategic Modernization Program and our stewardship in the management of the fiscal resources appropriated by the Congress. It will also address the fiscal year 1986 and outyear programs which are being undertaken to reinforce the capabilities of our strategic C³ system. I will not be discussing intelligence programs, per se, however, the information and capabilities provided by them play a major role in achieving a surviving and enduring C³ capability. I can assure you that we address them as a system package in support of all of our strategic forces and the National Command Authority.

II. COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE (C³I) MANAGEMENT

In the DOD Authorization Act of 1984, the Congress directed establishment of an Assistant Secretary of Defense (C³I) who shall have as his principal duty the overall supervision of DOD C³I affairs. Secretary Weinberger has reorganized the Office of the Secretary of Defense so that all C³I and related space systems matters are being transferred from the Under Secretaries for Policy and Research and Engineering, to the ASD (C³I), who will report directly to the Secretary. This consolidation of all C³I functions under one individual will ensure consistency of DOD policy development, resource management, and program evaluation, as Congress directed. This realignment coupled with prior Secretary of Defense initiatives to improve our strategy

and policy formulation processes, strengthens the Planning, Programming, and Budgeting System [PPBS], provides for greater participation of the CINCs in our prioritization efforts, and improves our acquisition management efforts to redress past deficiencies. Also transferred to the ASD(C³I) were direction, authority, and control over the Defense Mapping Agency, Defense Communications Agency, and the Joint Tactical C³ Agency, and primary staff supervision over the Defense Intelligence Agency and National Security Agency/Central Security Service.

III. STRATEGIC C³ RESOURCE SUMMARY

We manage all the C³ programs within a mission area structure, as shown on Figure 1, which helps us achieve a better overview and integration of the various C³ systems and the forces or weapons systems they support. The portion of this structure I am here to address this morning is shown on the upper left block of the table, and addresses three primary areas: warning; command centers and associated decision making facilities; and communications. In fiscal year 1986, the budget request for Strategic C³ programs is $5.2 billion.

COMMUNICATIONS COMMAND AND CONTROL (C³) MISSION AREA STRUCTURE

STRATEGIC C³	THEATER & TACTICAL C³	NAVIGATION/ WARFARE COMMAND & CONTROL	SUPPORT & BASE COMMUNICATIONS
• STRATEGIC C²	• THEATER C²	• LAND WARFARE	• SUPPORT COMMS
• STRATEGIC S&W	• THEATER COMMS	• AIR WARFARE	• BASE COMMS
• STRATEGIC COMMS	• TACTICAL C²	• NAVAL WARFARE	
	• TACTICAL COMMS	• NAVIGATION & POSITION FIXING	

EW & C³ COUNTERMEASURES	COMSEC	INFORMATION SYSTEMS AND DEFENSE COMMUNICATIONS SYS
• SELF-PROTECTION	• COMMUNICATIONS AND SIGNALS SECURITY	• INFORMATION SYS
• ESCORT; STAND-OFF & COUNTER C³		• COMPUTER SECURITY
• TACTICAL SURV., RECCE. & TARGET ACQ		• LONG HAUL COMMS
• MULTIMISSION, TECHNOLOGY & SUPPORT		• COMM. SERVICES INDUSTRIAL FUND

FIGURE 1

IV. STRATEGIC C³ POLICY OBJECTIVES AND REQUIREMENTS

The President's Strategic Forces Modernization Program, as an element of National policy, requires a highly capable strategic C³ system to strengthen deterrence of nuclear conflict by denying the Soviets any realistic prospects, however they may define them, of gaining an advantage by initiating the use of nuclear weapons.

Our strategic C³ system must provide the capability required to transform individual weapons systems into an integrated, effective force. This system must satisfy the needs of all echelons of our forces to observe, provide warning and attack assessment, process information, support decision making, communicate, navigate and degrade an enemy's ability to perform those same functions. The difficulty in achieving these objectives is underscored by the need for reliable, endurable, and survivable worldwide execution in peacetime, during crisis and conventional war, during

the transition to nuclear war, and through the period of nuclear conflict, which may be protracted, to termination.

The strategic C^3 system we are building must assure that our strategic forces can be used when and where they are needed; provide the capability for the National Command Authority [NCA], senior military commanders and subordinate force commanders to direct and manage their forces in support of national policy and defense strategy for employment of these forces. It shall provide assured survivability and endurability to enhance our deterrent posture and provide for a more stable deterrent. For a credible deterrent, the strategic C^3 system must of itself be absolutely credible because its purpose is to support and enable implementation of the gravest decisions that any President may ever have to make. The system must retain that credibility under the most severe stresses, and it must retain the capability to implement force employment decisions—made in accordance with rational security policy—under those stresses for perhaps extended periods of time.

V. ESSENTIAL STRATEGIC C^3 FUNCTIONS

As stated above, the following three key strategic C^3 areas are required to support our deterrent policy, and if deterrence fails, to bridge the transition from peace to war and then to conflict termination. I will discuss the individual programs in more detail during the hearing today.

Attack Warning and Attack Assessment [AW/AA]—which provides the unambiguous basis for determining that an attack has been initiated, including characterization of the attack in terms of its origin, composition and general objectives.

Command Decision Making—to take such actions as are needed and possible to prevent the forces from being destroyed before they can be employed, or to employ some or all of our forces in accordance with national policy.

Communications—to convey attack warning information to the decision makers for use by the NCA in conference with his senior military advisors in support of prompt response and force-survival decisions; for conveying orders to carry out such decisions to the forces; for reporting the results of these actions to decision makers and force commanders to form the basis for subsequent actions; and, in particular, to control escalation of the conflict and to bring the hostilities to a rapid termination on terms favorable to the United States.

The strategic C^3 systems I will address today, to include those dedicated to the attack warning functions, will do much to ensure the survivability and effectiveness of our forces. [Deleted.] These actions taken for force survival [deleted].

During the transition phase, the strategic C^3 system will be subject to severe stresses, including destruction of facilities, deliberate attempts to disrupt communications and sensor functions by jamming and the wide-ranging effects of high-altitude and surface nuclear detonations. As matters stand today, the central functions—(warning, conferencing, and decision making) must be accomplished [deleted]. Thus, an overall requirement of highest priority, even if force endurance is enhanced, is to assure to the greatest extent possible that these central functions can indeed be accomplished [deleted] that are available and that we build endurance into the supporting C^3 to permit such support [deleted].

The programs I will describe today are the result of several in-depth analyses of the capability of the strategic C^3 systems to funtion during the transition to war, [deleted] and the addressal of the C^3 system-weapon mix as a unified element. The initial analysis preceded the development of the Strategic Forces Modernization Program and was one of the key determinants which led to President Reagan's listing of strategic C^3 as the most important element of the modernization program. We are continuing [deleted]. To assure that our established goals remain realistic, the component elements of the program are developed in a coordinated and time-phased manner with continued high-level attention within the Department. We, therefore, have continued our strategic C^3 review process in concert with nuclear weapons planning, to provide an authoritative basis for program formulation, surveillance and guidance. [Deleted.]

ATTACK WARNING AND ATTACK ASSESSMENT

In the attack warning area we subdivide programs into those directed toward the ballistic missile threat and those associated with the atmospheric threat. In the ballistic missile surveillance and warning area, we are on contract for the procurement of two additional (total of four) PAVE PAWS radars to be operational in calendar year 1986 (Robins AFB, GA) and calendar year 1987 (near Goodfellow AFB, TX), which will eliminate gaps in our present coverage of submarine-launched ballistic missile (SLBM) areas in the southeast and southwest sectors of CONUS. The north-

east and northwest sites are fully operational. Our outyear programs will provide for pre-planned upgrades of the PAVE PAWS radars. The [deleted]. This will permit us to shut down the [deleted]. The PAVE PAWS radars provide one of the two independent types of observation means required for the SLBM detection and warning function. [Deleted.]

We have also begun acquisition of nuclear event sensors for deployment on NAVSTAR Global Positioning System (GPS) satellites to accurately locate and characterize nuclear detonations [deleted] on global worldwide basis. This system, known as the Nuclear Detection System (NDS), will permit assessment of damage we have sustained [deleted].

In the atmospheric threat surveillance area, the existing Distant Early Warning (DEW) Line is being upgraded significantly. This upgrade will result in a substantially improved capability to detect advanced aircraft and cruise missiles across the entire North American boundary. The resultant new system, called the North Warning System (NWS), will include thirteen long range radars (LRRs) and thirty-nine short range radars (SRRs), including associated communications. The LRRs which are proven equipment and [deleted] will be in place in the NWS [deleted]. The SRRs, which will operate unattended, are now under development and will be deployed [deleted]. The LRRs, which are designed for minimal manning and the unattended SRRs, will require substantially less manpower for their operation and, as a result, operational costs will be considerably reduced compared to the existing DEW line.

The NWS will be acquired and operated jointly with Canada. It is expected that cost sharing for the development, production, installation and operation of NWS will be on a sixty percent U.S./forty percent Canadian basis. Formal signing of an agreement reflecting this joint endeavor is expected in early 1985. The LRRs of the North Warning System will be installed and operating in [deleted]. Testing of SRR prototypes is expected to be completed in the same time period, with production commencing shortly thereafter.

The DEW Line upgrade, together with the new Over-the-Horizon Backscatter (OTH-B) radars planned for the east, west, and southern U.S., will provide complete contiguous surveillance coverage of all air-breathing approaches to North America and assure timely warning of bomber or cruise missile attacks on North America. The OTH-B radars provide all-altitude coverage for bomber aircraft from 500 nautical miles out to 1800 nautical miles, [deleted]. Detection and tracking of [deleted] cruise missiles is also being addressed in the OTH-B radar program. It is planned to deploy OTH-B radar sectors in the [deleted] to provide surveillance coverage against the [deleted] cruise missile threat. [Deleted] a live cruise missile test will be conducted to ascertain and confirm the detection and tracking capabilities against such threats. The first sector of the OTH-B East Coast system will be completed in fiscal year [deleted] and integrated with the remaining two sectors (—there are three sectors to a system) in fiscal year [deleted] to form a fully operational 180 degree East Coast system. In [deleted] of the West Coast OTH-B system will be procured.

The budget request contains $1.5 billion for the Tactical Warning/Attack Assessment mission area.

COMMAND DECISION MAKING

In the command and control decision making area, we are continuing to upgrade the survivability and capability of command centers that would direct U.S. strategic forces during all phases of operations from crises through nuclear conflict. All of the E-4B National Emergency Airborne Command Posts [NEACP] which serve the National Command Authority [NCA] during crisis or war have been delivered. [Deleted.]

Under the Aircraft Alerting Communications Electromagnetic Pulse [EMP] [AACE] program, in fiscal year 1986 we will complete system development and initiate procurement for systems which will provide EMP-protected facilities for strategic C^3 equipments at selected Air Force command posts and SAC Aircraft Wing Command Posts and alert facilities. Similar improvements are continuing at other command facilities. There is a continuing program to upgrade our electrical power capability/reliability at the Alternate National Military Command Center (ANMCC) and other command facilities. Our command centers are also continuing to be upgraded as new systems are phased in and equipments are upgraded to enhance their capabilities. Our programs to improve the communications capability and survivability of the EC-135 airborne command posts serving military commanders is continuing. Illustrative of this is the new fiscal year 1986 effort to assure that the [deleted].

The budget request contains $800 million for the Command Decision Making Mission Area.

COMMUNICATIONS CONNECTIVITY

Our strategic communications programs are structured to provide improved communications between sensor sites, command locations (including the NCA) and nuclear capable forces. Improvements and new acquisitions emphasize survivability and endurability.

In the satellite communications (SATCOM) area, we are continuing to make improvements in the quantity, quality, and cost effectiveness of our programs. We have launched the first two UHF LEASAT satellites and we expect to launch two additional LEASAT satellites this year. These satellites, combined with the [deleted]. Further, we plan additional FLTSATCOM satellites [deleted]. In addition, we are continuing the development of the MILSTAR satellite and terminal systems at a rapid pace with the [deleted]. This program will provide the most highly enduring and jam-resistant satellite space segment for two-way connectivity to the strategic and tactical forces we have ever designed and deployed. For the Defense Satellite Communications System (DSCS), we have an operational [deleted]. In order to achieve cost reduction, we are implementing a multi-year procurement program for the acquisition of the remaining [deleted] satellites. These new satellites will provide increased survivability, capacity, improved jamming protection and improved autonomy with less dependence on the [deleted]. To provide even more survivability we are initiating a survivable DSCS control system [SDCS]. This system will provide DSCS with a survivable [deleted] control system. [Deleted.] We expect to continue [deleted] capability.

In the area of strategic ground-based communications, we are continuing to implement the communications improvements identified in the forces modernization program. We are now on contract for implementing the second phase of the Ground Wave Emergency Network [GWEN]. This system will operate at low frequency and connect major command locations, sensor sites, strategic bomber bases, missile launch control centers, and strategic defense sites. The system will have sufficient relay node proliferation to provide high assurance of EMP-protected [deleted] communications for support of the [deleted] functions. In fiscal year 1985 testing of the initial austere system was completed and installation of the second phase —Thin Line Connectivity Capability (TLCC)—continued. The TLCC will add additional command centers, more relay nodes, and additional user terminals. It will be operational [deleted]. Fiscal 1986 funding will facilitate this work [deleted] as required.

The SAC Digital Information Network [SACDIN], which will provide automatic CINCSAC and SAC SIOP force connectivity will alleviate the significant deficiencies in the responsiveness and maintainability of the existing aging, limited-capability SAC data transmission subsystem. IOT&E and limited production was started in fiscal year 1984. Production will continue in fiscal year 1985 and installations will begin late in the same fiscal year [deleted].

The development and acquisition of an austere extremely low frequency (ELF) communications system to enhance survivability of our fleet ballistic missile (FBM) force is now proceeding as a very vital element of our strategic C^3 system. In [deleted]. The addition of an ELF capability is a vital complement to existing and planned communications systems to our submarine force since ELF offers much unique assured connectivity under jamming, weather, and other effects.

The FBM submarine force is the most survivable leg of the strategic triad. The deployment of the Trident weapon system has greatly expanded communications coverage requirements which directly impact the TACAMO operation. The E–6A, with greater range, speed, and endurance, will address these requirements. It will replace the aging EC–130 aircraft to significantly enhance the survivability, endurance, and performance of the vital TACAMO mission. We are currently on contract for the development phase of this program and this effort will continue in fiscal year 1986. We have submitted, per Congressional request, the TACAMO Alternatives Study. The report documents conclusions reached after two years of additional analysis that the E–6A aircraft remains the strongly preferred alternative to support the FBM submarine force.

The budget request contains $2.9 billion for the strategic communications mission area.

VI. CONCLUSION

A comprehensive and integrated stratgegic C^3 system is an absolute necessity to implement the President's strategic modernization program. The C^3 system must be

implemented as a complement with, and not at the expense of, the forces modernization efforts.

We must be able to accurately sense and estimate the specific objectives of an attack and communicate with our forces prior to, during, and after, an attack. This capability is essential if we are to retain the ability to direct our strategic forces in a counterthrust which will result in damage unacceptably high to an enemy and, as such, deterring them from ever initiating an attack.

The individual program highlights presented above illustrate our achievements and progress in implementing the strategic C^3 portion of President Reagan's Forces Modernization Program first announced on October 2, 1981, and supported by the Congress in response to our prior year budget requests. Our ongoing efforts have continued to build upon and refine that modernization program to achieve a strategic C^3 system which meets national policy and defense strategy requirements. The acquisition efforts are complemented by a vigorous and in-depth research and development program leading to C^3 systems that would endure and survive for a protracted period beyond the first nuclear attack and support war termination and reconstitution efforts after an attack. The achievement of these capabilities will require continued dedication and intense efforts by each of the Services, major defense resource commitments, maintenance of economic production rates, and the continued support of the Congress. A set of Strategic C^3 overview tables are attached.

STRATEGIC COMMAND, CONTROL AND COMMUNICATIONS

[TOA—in billions]

	Fiscal year—		
	1984	1985	1986
By mission area:			
Tactical warning/attack assessment	1.4	1.1	1.5
Command decision making	.8	.8	.8
Strategic communications	2.1	2.4	2.9
Total	4.3	4.3	5.2
By appropriation:			
RDT&E	1.2	1.5	1.5
Procurement	2.0	1.5	2.2
Military construction	.1	.1	.1
O&M	.7	.8	1.0
Military personnel	.3	.4	.4
Total	4.3	4.3	5.2
By DOD component:			
Army	.7	.7	.8
Navy/Marine Corps	.7	.6	1.0
Air Force	2.8	2.9	3.3
Other	.1	.1	.1
Total	.3	4.3	5.2

Senator WILSON [presiding]. Thank you very much, Mr. Secretary.

What priority do you attach to surveillance and tracking system and tactical warning and tactical assessment programs which are other than SDI?

Mr. LATHAM. That is a good question. There are several pieces of the SDI program in particular, the [deleted] SDI.

We attach very high priority to that program. In fact, in 1986 the request for the [deleted] up to [deleted] million from a much smaller number in 1985 because we are ready to cut down the competition from four contractor teams to three and get a serious hard-

ware definition of that program going. We so informed General Abrahamson on that. [Deleted.]

Senator WILSON. Would you have pursued that independently of the SDI efforts?

Mr. LATHAM. Yes. In fact, it was called the Advance Warning System prior to the grouping together of all the program elements under the umbrella of SDI. We had that underway before anyone invented SDI.

Senator WILSON. In view of the expanded efforts by the Soviet system, would the continental air defense mission be given a higher priority in our defense program and could you comment specifically on what kind of anti-cruise missile capability is given us by the over the horizon radar?

Mr. LATHAM. Yes, sir. I think the priority we have is about right. I would like to see some more support for some additional AWACS aircraft. That is the one area that we have not been able [deleted].

Our plan calls for at least [deleted] additional aircraft.

Second, on the over the horizon radar, we intend, in terms of trying to understand the [deleted].

In fact, that is where we learn a great deal about their program. We are reasonably confident we can [deleted].

Senator WILSON. Does the important work being done to enhance the survivability of our space systems suggest we should be able to make the SDI adequately survivable?

Mr. LATHAM. That is a tough one to answer. Let me try to take it in pieces. [Deleted.]

Senator WILSON. Let me interrupt you there.

Let us assume that these devices work. Isn't there a problem with [deleted].

In other words, if they have taken a shot, [deleted].

Mr. LATHAM. [Deleted.] For example, we have [deleted].

Senator WILSON. Could you comment a little further on the connectivity problem as it relates to our ability to effectively communicate with submarines in case of a nuclear crisis?

Mr. LATHAM. Yes, sir. We have today several different means to connect to submarines from a communications point of view. We can talk to subs and then talk back if they want to [deleted]. That is one.

Second, we can talk to the submarine if we want to from a TACAMO platform [deleted].

We can talk to submarines using [deleted] or from fixed land-based sites. VLF is used primarily today as the primary form of communications to them because they can stay submerged [deleted]. If the signal stops, they immediately go to different communications modes. [Deleted.]

So, we have those means right now.

Senator WILSON. The ability we have to communicate depends on certain submarine vulnerability?

Mr. LATHAM. I think the submarine force is our most survivable leg of the triad in point of view that a Trident at sea is, I think, highly survivable even under intense wartime conditions because of the nature of the system in terms of its quieting and type of tactics we would use.

The real issue is not so much the survivability of the platform. I think they are quite survivable and will be there for [deleted].

The question is can we design a system that will allow [deleted]. That is the real issue.

Now, can you make the so-called TACAMO airplanes survivable for [deleted]. We think we can make them survivable for [deleted] however.

As part of our continued concern about this, we are [deleted].

We did this successfully just a few weeks ago. So, our answer to that [deleted]. That will be our fallback under the worst conditions.

Senator WILSON. I can see that gives you a certain redundancy and a high degree of reliability that there will be communications.

The question is: does that give you a sufficient level of confidence that the submarine launch capability could be classified as prompt?

Mr. LATHAM. I believe so. We will be able with [deleted]. We believe one could have EAS's transmitted and received in a very prompt period of time.

Even with the VLF communications in use today one can reasonable expect to get an [deleted] depending on where you are in the world, including jamming and things of that nature.

So, it is something that you could have in terms of connectivity [deleted].

The issue with the blue laser communications concept is not so much will the engineers be able to make it work, but can you make it survivable and is it cost effective? Can you do it without breaking the bank?

I believe we are moving toward having a [deleted].

Senator WILSON. Thank you very much.

Mr. Secretary, my time is up. I will call on Senator Hart.

I think Senator Glenn came in after you made the comment about the GWEN network.

Senator HART. Mr. Latham, which side is benefited and which side is hurt by an unlimited race in antisatellite capability?

Mr. LATHAM. I am not sure either side is necessarily hurt. It is a capability that he obviously has pursued with great vigor up to now. In fact, we credit him with a deployed capable system today, at least low altitude.

We are pursuing a more capable, quite different approach to the ASAT capability. I think it is something that one should have in that the value of space systems is such that to modern warfare today if you had to go to war, you would find that he is as dependent as are we on such systems. He probably would want to be able to have some capability to take them out.

Senator HART. That presumes there is not another option [deleted].

Mr. LATHAM. I don't think there is any way to [deleted]. That is one. I can give you a half dozen more, but they get more and more compartmented.

Senator HART. If, under the treaty, the Soviets were to [deleted].

Mr. LATHAM. You then have the problem that there are still lots of [deleted].

Senator HART. I understand that, but up to now SALT I and SALT II and other agreements have been based on our own mili-

tary and intelligence communities guarantees that the terms of the agreement will be verified.

Mr. LATHAM. [Deleted.]

Senator HART. In other words, present technology for sending up an interceptor, whether our type or their type, is a real problem. [Deleted] and so on, that concern you?

Mr. LATHAM. [Deleted.]

Senator HART. Under what kind of classified condition could this committee find out about that?

Mr. LATHAM. It would have to be a [deleted].

Senator HART. Could we set that up?

Senator WILSON. I will communicate it to the subcommittee chairman. I am sure he would be delighted.

Senator HART. I would like to find that out, myself.

Mr. LATHAM. There are technologies around that are very interesting and can be used. I might point out some of the things.

[Deleted] they have the capability. They are very good at it.

FALSE ALARMS

Senator HART. Let us pursue this. Mr. Latham, could you estimate now as specifically as possible for the committee the number of false alarms of our strategic warning system in NORAD over the years?

Mr. LATHAM. We have not had any situation like that in the last 4 years. Back in 1979 and 1980 there were two malfunctions in the NORAD system that caused temporarily, for a couple of minutes, some false targets to be generated and people thought something was happening.

We took extraordinary measures since then to ensure that that couldn't happen again. So far we have had nothing even close to that. For example, one of the causes of one of the malfunctions was that people ran a test case in the system to train people. Well, we set up a completely offsite test facility now where we train people. [Deleted.]

The other one was a malfunction in a communication handling device where one little chip failed and started sending out random ones and zeros that it shouldn't have. Those communications and processors have been completely rebuilt.

We have built a software message checking system that does not allow erroneous messages to get out. We have sent out hundreds of millions of messages over the last 4 years without any errors.

Senator HART. That is gratifying.

Senator Goldwater and I were the committee members who looked into that. We found 161 instances over an arbitrary 18-month period.

You are saying that since 1980 there have been zero?

Mr. LATHAM. I don't know of any instances since 1980 that have been considered in the same context as a false alarm type of incident.

Senator HART. I don't know what word I am looking for then, but our committee report documented 161 instances of some degree, some of which may have lasted only a few seconds, but some threat

warning was issued on the system. I find it hard to believe that you went from 161 in 18 months to zero in 4 years.

Mr. LATHAM. I will have to check exactly what your definition was and what mine is. I don't know anything that led to an order to bombers or anything like that.

Senator HART. Oh, no, most of those did not result in anything.

Mr. LATHAM. If you go to the [deleted] ground site and look at these guys who have to deal with what that satellite "sees" in the way of [deleted] out there, you have a man in the loop making decisions as to what it is or isn't.

There are many cases when you are not quite sure and you have to have a good close look at it. For a few seconds you might have a target you think is a missile and it is not.

Senator HART. I think that is what I am talking about.

Mr. LATHAM. That happens routinely, so to speak. It is a very complex problem, sorting out all this [deleted] data that is coming in.

One of the things the new [deleted] will do is help immeasurably in sorting through that.

STRATEGIC WARNING SYSTEM

Senator HART. Do you have any recommendations to the committee on hardware or software acquisition in the strategic warning system, broadly defined, that this committee ought to undertake?

One of the things Senator Goldwater and I recommended was to break down the fairly rigid internal Air Force and DOD procurement regulations, particularly on advanced computer technology. I gather that has been fixed?

Mr. LATHAM. Yes. It has. We are able to procure the necessary modernized computers for the system without having to go through all the bureaucratic hoops that some other type of computer acquisitions require.

We are, in fact, underway with a very aggressive modernization program of everything inside the mountain. Basically we are gutting the mountain over a period of time and putting in new equipment. We are putting in more capability for CINC NORAD.

In case CINC NORAD [deleted]. We have developed a new attack warning assessment, architecture that will allow the system to work even under the worst conditions.

Senator HART. The city of Denver is thinking about expanding and relocating its airport. The Air Force at some level has indicated concern about the facility.

I would like personally, representing the State, to work with the Defense Department, your office or whomever, in helping work that problem out.

Mr. LATHAM. OK, sir.

Senator HART. You are familiar with it?

Mr. LATHAM. Yes, I am. We will certainly be glad to work with you on that.

SOVIET STRATEGIC WARNING SYSTEM

Senator HART. Finally, Mr. Latham, if you didn't before I came in, will you let the committee know in some form now and expand on it later about the Soviet system?

How would you stack up their entire strategic warning system against ours and do you have any intelligence on whether or not their system could issue a serious enough false alert to cause them to take action that might seem threatening to us?

Mr. LATHAM. I could provide a detailed answer for the record. [Deleted.]

We can take that for the record.

[Retained in committee files.]

Senator HART. Mr. Chairman, it might be interesting to have somebody from the Agency let us know how adequately the Soviet warning system is and what are the possibilities for false alarms.

Thank you very much.

Mr. LATHAM. Yes, sir.

Senator WILSON. Senator Glenn?

Senator GLENN. Thank you, Mr. Chairman.

If we have one Peacekeeper system in this country, to me it is our submarine system, largely undetectable and out there [deleted.] Now, that is a long time.

I followed up with some questions. It turned out it was all in [deleted] and that sort of thing. Is that a valid figure or did I misunderstand something?

Mr. LATHAM. That sounds a lot longer than I would say it would take to get an [deleted].

Senator GLENN. General Bennie Davis said that.

Mr. LATHAM. I will have to check to see why he said an [deleted]. [Deleted] but I will check that for you.

[Retained in committee files.]

Senator GLENN. Where is ELF going in now?

Mr. LATHAM. Wisconsin and Michigan, two sites interconnected electronically. There are [deleted] of antenna in Michigan and [deleted] miles in Wisconsin.

Senator GLENN. All local environmental concerns are taken care of?

Mr. LATHAM. Yes. And there are [deleted] in Wisconsin at Clam Lake. It is above ground. It looks like a high power line. [Deleted.]

Senator GLENN. When will that be completed?

Mr. LATHAM. [Deleted.]

Senator GLENN. Yes.

Mr. LATHAM. We will have initial operational capability in [deleted].

Senator GLENN. Can that be jammed?

Mr. LATHAM. [Deleted.]

Senator GLENN. Do we have ways of [deleted].

Mr. LATHAM. [Deleted.]

Senator GLENN. The blue-green laser communication system would require satellite operations; is that correct?

Mr. LATHAM. No, sir. You could, if you wanted to for local use, put a blue laser in an aircraft which we have done and communicate with the submarines that way.

For a local area type communication between the submarine and aircraft you could do it that way. In general, what has been discussed and described is a blue laser based in satellites at syncronous and other altitudes communicating worldwide with the submarine.

SOVIET RADAR SYSTEMS

Senator GLENN. With what you know about the Soviet radar systems and their detection systems, do you give them a capability for the trajectory back track?

In other words, so they would know where the shot came from on the submarines?

Mr. LATHAM. That has been looked at, that so-called [deleted].

Senator GLENN. You talk about all the Soviet radars that are deployed. [Deleted.]

Do they deploy them [deleted].

Mr. LATHAM. [Deleted.]

Senator GLENN. Before I leave the issue of the [deleted] you will supply that for the committee?

Mr. LATHAM. Yes, sir. I will track that down.

Senator GLENN. That is a very important figure. I could not imagine it took an [deleted].

Mr. LATHAM. Yes, sir. I have never heard that number before, myself.

Senator GLENN. [Deleted.]

Mr. LATHAM. Yes, sir. We are structuring the satellite to have structural integrity at least to a [deleted].

Senator GLENN. Is that [deleted].

Mr. LATHAM. I think it will have to be an [deleted].

Senator GLENN. The Soviets have a capability with their orbital intercept. We give them capability for developing that. This will be able to [deleted].

Mr. LATHAM. Yes, sir.

First of all, the current ASAT we only credit with relatively low altitude intercept capability. [Deleted.]

Senator GLENN. I presume we would be designing any [deleted].

You are talking mainly about geosynchronous?

Mr. LATHAM. No, I am talking about low altitude ASAT today. [Deleted.]

SMALL ICBM

Senator GLENN. I have been an advocate of the small ICBM. I feel placing the MX in the fixed silos and making them a more attractive target is not the way to go. I have favored a land-based, two-dimensional system somewhat like a sea-based, three-dimensional system as far as targeting difficulty goes.

Dispersion to me has been far more attractive for a number of years, 5 years as a matter of fact. I know there are some problems involved with communications before you could fire a small ICBM.

Would you address those problems?

Mr. LATHAM. Yes, sir, we are looking at the command and control of the small ICBM force in the following way.

First of all, we will probably have on [deleted].

Senator GLENN. What kind of accuracy does that give [deleted].

Mr. LATHAM. [Deleted.]

Depending on whether or not you use an airborne command post as a further backup, you would put on UHF for line of sight.

Now, the architecture for the small missile command and control also has considered [deleted].

Senator GLENN. [Deleted] will tie into this also?

Mr. LATHAM. No, sir.

Senator GLENN. Is there any way [deleted] can be tied in?

Mr. LATHAM. [Deleted.]

Senator GLENN. You have to have a [deleted] receiver?

Mr. LATHAM. Right now you have to have a [deleted].

Senator GLENN. You don't get enough power, you don't put enough power on that transmitter that you could go to a [deleted].

Mr. LATHAM. I don't think so. I would have to take a look at that. I will have to take that for the record.

Right now we are not envisioning an [deleted] antenna.

[The information follows:]

An ELF receive capability can be achieved by using either a loop antenna, approximately one meter in diameter, or a one meter whip antenna. On a moving land-based vehicle, a whip antenna would be the preferred receiving antenna in order to mitigate vibration generated ELF noise.

Senator GLENN. Once you go to a [deleted] then you become jammable. I don't know the answer to that.

Mr. LATHAM. I don't either. The other systems are sufficiently robust that we would be able to stay connected with the small missile and know where he is. That is one of the beauties of the [deleted].

Senator GLENN. Only one other question. This is an organizational matter.

REORGANIZATION

You indicate the Assistant Secretary of Defense will be in charge of all the C^3 programs from now on.

Mr. LATHAM. My position has been changed within Mr. Weinberger's staff. I am called the Assistant Secretary for Command, Control, Communications and Intelligence. I now report directly to Mr. Weinberger.

In addition to that, as far as reorganization of his staff, he took some parts of what were previously in the policy organization and moved them under me. So, I now have the responsibility for oversight and resource management and policy in one office.

Senator GLENN. You get defense mapping and DCA and joint tactical, C^3I and NSA. That is quite a bundle.

Mr. LATHAM. Yes, sir.

Senator GLENN. Is that a new move?

Mr. LATHAM. Yes, sir. It was announced on the 29th of January.

At the same time Mr. Weinberger created a new Assistant Secretary for Acquisition and Logistics to try to handle the procurement issues and the life cycle support issues of defense programs in a more focused manner.

So, he has two major reorganizational pieces to that.

SATELLITES

Senator GLENN. Back to satellites, one other question, Mr. Chairman.

I presume all of our acquisition and as far as we can tell, the Soviet acquisition of where satellites are in tracking, this will all be done by radar solely?

Mr. LATHAM. No. We do it by two different ways. One is by radar. The other is by [deleted] arrangement. It is a space surveillance system called GEODDS.

We are in the process of deploying five major sites around the world. Three of the five are in and operational. [Deleted.]

They compare the [deleted].

In addition to that, we have space surveillance radar systems that do that.

Senator GLENN. Do we give the Soviets that same capability for the [deleted] monitoring?

Mr. LATHAM. [Deleted.]

Senator GLENN. What I am building up to is this. On [deleted].

Mr. LATHAM. We can apply the technology.

Senator GLENN. To some extent?

Mr. LATHAM. Yes, sir.

Senator GLENN. Are we planning that on future satellites?

Mr. LATHAM. The answer is [deleted].

Senator GLENN. OK, fine.

Mr. LATHAM. I think we need [deleted].

Senator GLENN. In some ways that would be like we are [deleted] in effect, turning that around.

Mr. LATHAM. Yes, sir. That is part of the concept.

Senator GLENN. I can see what the application would be. I didn't know about that. Thank you very much.

Senator THURMOND [presiding]. Thank you.

Mr. Latham, I have a few question I would like to expound to you.

Can you summarize for the subcommittee those attack assessment and warning, command decisionmaking, and strategic communications improvements that have actually been deployed since 1981?

Mr. LATHAM. Yes, sir. You say actually been deployed since 1981. We have not deployed yet the new [deleted]. They are in development. The first of those will be deployed [deleted]. The PAVE PAWS radars, the two radars that are deployed were completed in about the 1981–82 time frame, the first two.

Since then we have selected sites and have two more in deployment right now, but they are not fully operational and won't be for another [deleted]. Since 1981 the experimental east coast over the horizon radar has been turned from as experimental facility into a full operational facility and will be fully operational in [deleted].

In terms of supporting communications for the warning and attack assessment function, we have put in the initial stages of the Ground Wave Emergency Network. [Deleted.]

We have made major upgrade inside the NORAD Cheyenne Mountain complex in terms of [deleted].

The program is underway to deploy long-range [deleted] radars in Alaska and in Canada, or north warning, and that is about it.

There has not been a lot deployed since 1981. There has been a lot of R&D. The deployments are starting to come on line in the 1986–89 time frame, the major deployments.

Senator THURMOND. Mr. Latham, have these improvements brought about any change in our policy with regard to the basis for launching a retaliatory strike following a Soviet first strike?

Mr. LATHAM. No, sir, I don't believe that has changed anything in the policy area. I think what we are doing in the way of improving the sensors, supporting communication and decision aids, is to allow the President the greatest amount of flexibility you could possibly give him in the most amount of time in order to make whatever decision he feels is important to make at the time.

I don't see any change in policy as a result of that. It is giving us a much more sure survivable and enduring capable system.

Senator THURMOND. Mr. Latham, can you comment on the current status of the Defense Support Program [DSP] satellites now on orbit?

Are we more sensitive than in the past to earlier than expected failures in these satellites?

Mr. LATHAM. [Deleted.]

Senator THURMOND. Mr. Latham, is it your understanding that user fees associated with commercial use of the global positioning system are no longer required?

Mr. LATHAM. Yes, sir. I do not believe we should impose user fees.

Senator THURMOND. Mr. Latham, how confident are you in the estimate that Canada will share 40 percent of the costs for the north warning system?

Mr. LATHAM. I am reasonably confident of that. We have had enough negotiations now that we almost have the memorandum of understanding completely negotiated. The President is going to Canada, as you know, and we have high expectations they will sign and support the program as they have said.

TACAMO AIRBORNE RELAY SYSTEM

Senator THURMOND. Mr. Latham, the committee has received the Department of Defense report on alternatives to the Navy TACAMO airborne relay system in response to last year's authorization report.

Would you summarize for the committee the salient conclusions of that report from your perspective?

Mr. LATHAM. Yes, sir. We sent over to you a new report on that particular so-called TACAMO aircraft communications relay system. The report again reaffirms the Secretary's decision, and reaffirmed by the Chairman of the Joint Chiefs, that the best solution is what is known as an E–6A airframe as opposed to the C–130 that we use today to perform that mission.

That is based on a number of factors having to do with cost, survivability, endurance, payload capability, growth capability, and so on.

Importantly, in that survivability equation, is where you base such aircraft. Our preferred choice is this E-6A system of which the budget request for 1986 is quite substantial, it is $400 million in procurement and $86 million in R&D to buy the first couple of aircraft with R&D funds.

Senator THURMOND. Mr. Latham, in your view, is basing of the TACAMO airborne relay [deleted] a critical factor in the preference for the E-6A, and will the E-6A be [deleted].

Mr. LATHAM. [Deleted.] So, we feel that that was a key factor in the decision.

SPACE SYSTEM SURVIVABILITY

Senator THURMOND. Mr. Latham, in response to this committee's interest in space asset survivability last year, the Department of Defense has just forwarded a very useful report on the survivability of our space systems.

In your view, what are the more critical survivability deficiencies, how does the budget now before us address these specifically, and what areas of concern are not adequately funded?

Mr. LATHAM. You mentioned, sir, that report was again forwarded to you from my office. It does point out at least for the [deleted].

Senator THURMOND. Mr. Latham, I may have one more question to be answered for the record.

Mr. LATHAM. Yes, sir.

Senator THURMOND. Our distinguished member of the subcommittee, Mr. Hart.

Senator HART. Thank you, Mr. Chairman.

SURVIVABILITY OF CHEYENNE MOUNTAIN

Mr. Latham, what is the present survivability of Cheyenne Mountain in P.S.I. terms?

I know when that facility started in 1950 there were different circumstances.

What kind of yield and accuracy and overpressure can it stand?

Mr. LATHAM. [Deleted.]

Senator HART. What does that do to the rest of the system?

Mr. LATHAM. First of all, it takes [deleted]. That is how we are planning our system today to take survivability action.

CINC NORAD will [deleted].

Senator HART. When you say [deleted].

Mr. LATHAM. Right now we are looking at a [deleted].

Senator HART. How far away from that are we?

Mr. LATHAM. [Deleted.] In fact, we could have a crude capability much sooner than that.

Senator HART. Should we?

Mr. LATHAM. Yes.

Senator HART. Whom do we need to convince of that?

Mr. LATHAM. The [deleted].

Senator HART. I hope all in the room have heard this.

Mr. LATHAM. It is no secret that we have tried to [deleted].

[Deleted] in my judgment, to move out as rapidly as we could have on those initiatives.

Senator HART. What are the counter arguments? Just budgetary?

Mr. LATHAM. It is largely that, [deleted]. I can't take any more. What you are saying is absolutely correct; we do need to do it and we will fund it heavily starting in 1987.

So, I just have had to wait a year.

Senator HART. Maybe you can wait 1 year, but the country can't.

Mr. LATHAM. [Deleted.] That is probably the basis, it is OK on risk taking to wait a little longer.

SDI

Senator HART. Let me see if I understand SDI. The system, broadly defined, is [deleted] is it not?

Mr. LATHAM. Yes, it is, as currently envisioned.

Senator HART. That is our ability at [deleted].

Mr. LATHAM. That is correct.

Senator HART. Up to and including launching missiles?

Mr. LATHAM. Yes.

Senator HART. If I understood what you told me earlier today, which I must say I am very surprised at, they now have the ability that you have discussed here, and are willing to discuss in more detail elsewhere, [deleted].

Mr. LATHAM. I didn't say that. I said that there are [deleted].

Senator HART. I heard you to say that with respect to existing radars [deleted].

Mr. LATHAM. That is correct. I said earlier that what he has likely [deleted].

Senator HART. As a general proposition, we should assume if we can do something sooner or later, and if you want to be conservative, say sooner, he will be able to do it?

Mr. LATHAM. In general terms, that is correct.

Senator HART. So, we should not assume that over a long period of time that we will be able to [deleted] that he will not be able to——

Mr. LATHAM. [Deleted.]

Senator HART. I must say I am beginning to hear testimony that seems to contradict your earlier statements. You were pretty categorical in your assertions earlier and you did not say at that time that it didn't matter. You say we have sufficient ASAT capability.

What I was hearing you say was that we should assume that the Soviets have or would have very soon an ASAT capability such that [deleted].

Mr. LATHAM. One would have to, under a conservative judgment I guess, say if it is that important to us, it will be important to him to try to negate it. [Deleted.]

As we continue to press with whatever form SDI takes, he will clearly try to respond to it as we would to his SDI. What is often overlooked is that he—the Soviets—has a SDI Program that is far bigger in scope and more extensive than ours. It has never received the publicity it should have.

For example, he has a larger program, that is evident in [deleted] that he has a high energy laser program [deleted].

Senator HART. He has missiles three times bigger than ours.

Mr. LATHAM. Why are the Soviets apparently so afraid of SDI? Because maybe they have enough work under their belt they believe it might be able to work.

Senator THURMOND. Would you repeat that.

Mr. LATHAM. Based on enough R&D work that maybe they are convinced some components of SDI are more feasible than others think.

Senator HART. I guess what I am trying to get at is this: what you have said is that there is no iron clad operative way of knowing whether [deleted].

If you don't know that, how do you know SDI is going to work?

Mr. LATHAM. Because at the same time that we have [deleted].

Remember, you have to [deleted]. Let me give you an example of how difficult that is, two real world examples that are unclassified.

In the late 1970's at RCA, and I was vice president of engineering for RCA's Government Systems Division, and I was painfully aware of this, we launched what is known as RCA SATCOM III, a commercial communication satellite. It was launched from the Cape on an ordinary expendable launch vehicle, put into an elliptical transfer orbit on its way to synchronous. During the elliptical transfer orbit you then fire what is known as an apogee kick motor that puts the satellite on a track into synchronous.

Whatever happened, we are not sure, but something happened when the apogee kick motor was ignited. We know it only burned some few tens of seconds and it should have been burning longer.

At that point in time we lost all telemetry from the satellite [deleted].

Two or three weeks later a Japanese communications satellite, also built in the United States, using, unfortunately, the same motor, did the exact same thing. We lost it. When the apogee kick motor was ignited. [Deleted.]

Senator HART. I understand that. NORAD goes to great length to prove that the opposite is the case.

Mr. LATHAM. NORAD helped us [deleted].

Senator HART. To summarize the two sides of your testimony, what you have said is that there will [deleted].

Mr. LATHAM. There is a degree on both sides.

First of all, as I said and you stated correctly, I think the [deleted].

Second, I think we would, as prudent designers and engineers, before anybody commits to a SDI system, have high assurance, as best one can bring before people like yourself, that we know how to [deleted].

That is why we have to pour R&D in that area to make sure we have that confidence. I am sure it can be done. [Deleted.]

Senator HART. Thank you, Mr. Chairman.

[Questions for the hearing record with answers supplied follow:]

QUESTION SUBMITTED BY SENATOR STROM THURMOND

OVER THE HORIZON RADAR

Senator THURMOND. Mr. Latham, you indicate in your prepared statement that we will not test the Over-the-Horizon radar against a live cruise missile until 1987. In view of the immediacy of the Soviet sea-launched cruise missile threat, why does

that test take another two years, and what is your current assessment of OTH-B capabilities against cruise missile-sized targets?

Mr. LATHAM. OTH-B radar testing against live cruise missile targets will culminate a series of tests using small aircraft and drones that are representative of cruise missile targets. Currently, testing is on-going using the Wide Aperture Research Facility (WARF) OTH radar, which is located in California. WARF testing will continue into 1986, utilizing small aircraft for targets. As part of this test program, it is planned to update the WARF temporarily in order to make it function more like the OTH-B; thus, test results are expected to be representative of that expected from an OTH-B operational system. When the first sector of the OTH-B East Coast system becomes available for testing in the summer of 1986, it will be used for continuing SLCM-related testing. In this case, [deleted]. It is expected that the WARF and OTH-B testing and related analytical work will place us in a good position to plan for and accomplish live cruise missile testing. There is high confidence that the OTH-B will [deleted] is less certain, and it is in this area that testing and analyses are required. Initial testing in the area has been encouraging, but considerably more work is required.

QUESTIONS SUBMITTED BY SENATOR DAN QUAYLE

NEACP

Senator QUAYLE. How vulnerable is NEACP to a close-in Soviet submarine launched ballistic missile attack?

Mr. LATHAM. [Deleted.]

Senator QUAYLE. What can be done to reduce the potential vulnerability?

Mr. LATHAM. [Deleted.]

CAPABILITY OF ROBUST AIR DEFENSE AGAINST TBMS AND OLDER SLBMS

Senator QUAYLE. Could robust air defenses afford protection against tactical ballistic missiles and older submarine-launched ballistic missiles?

Mr. LATHAM. Both SDI and the Strategic Defense Architecture 2000 (SDA 2000) study are currently evaluating the technical feasibility and cost of defense against SLBMs and Tactical Ballistic Missiles (TBMs). SDI technology appears promising in the long term against high apogee tactical ballistic missiles and the older SLBMs.

CAPABILITY OF SOVIET SA-10 AND SA-X-12

Senator QUAYLE. Are the Soviet SA-10 and SA-X-12 air defense systems? Do they have any capability against Pershing I and II, and our older SLBMs?

Mr. LATHAM. Both the SA-10 and SA-X-12 surface-to-air missile (SAM) systems are air defense systems; however, the SA-X-12 is both a tactical SAM and anti-tactical ballistic missile. It may have the capability to engage the Lance and both the Pershing I and Pershing II ballistic missiles as well. In addition, the SA-10 and the SA-X-12 may have the potential to intercept some types of U.S. strategic ballistic missiles.

NATO AND JAPAN WILLINGNESS TO COST-SHARE IN A ROBUST ATBM

Senator QUAYLE. To what extent are our NATO allies and Japan willing to cost-share development of a robust anti-tactical ballistic missile capable air defense system?

Mr. LATHAM. At this time, we do not know the extent of our NATO allies and Japan's willingness to cost-share the development of a robust anti-tactical ballistic missile (ATBM) system. We will have a better idea as our allies respond to our recent invitation to join in SDI research.

ICBM LAUNCH

Senator QUAYLE. If the U.S. waits until it confirms that Soviet warheads have detonated on U.S. soil, could it secure a Presidential decision in time to launch its most accurate ICBMs?

Mr. LATHAM. Yes. There are [deleted] factors which work in harmony to provide this assurance. [Deleted] as brought out by the President's Commission on Strategic forces, "The different components of our strategic forces would force the Soviets, if they were to contemplate an all-out attack, to make choices which would lead them to reduce significantly their effectiveness against one component in order to attack

another. For example, if Soviet war planners should decide to attack our bomber and submarine bases and our ICBM silos with simultaneous detonations—by delaying missile launches from close-in submarines so that such missiles would arrive at our bomber bases at the same time the Soviet ICBM warheads (with their longer time of flight) would arrive at our ICBM silos—then a very high proportion of our alert bombers would have escaped before their bases were struck. This is because we would have been able to and would have, ordered our bombers to take off from their bases within moments after the launch of the first Soviet ICBMs. If the Soviets, on the other hand, chose rather to launch their ICBM and SLBM attacks at the same moment (hoping to destroy a higher proportion of our bombers with SLBMs having a short time of flight), there would be a period of over a quarter of an hour after nuclear detonations had occurred on U.S. bomber bases, but before our ICBMs had been struck. In such a case the Soviets should have no confidence that we would refrain from launching our ICBMs during their interval after we had been hit. It is important to appreciate that this would not be a 'launch-on-warning,' or even a 'launch under attack,' but rather a launch after attack—after massive nuclear detonations had already occurred on U.S. soil."

[Deleted.]

MOBILE SATELLITE GROUND STATIONS

Senator QUAYLE. What is being done to make our satellite ground stations mobile? How many different sorts of defense or military satellite systems do we have; how many of these systems have mobile ground stations?

Mr. LATHAM. Essentially, DOD has three military satellite communications systems. Our UHF system utilizes FLTSATCOM and LEASAAT satellites and provides communications to the Navy and other users. Our SHF system uses DSCS satellites and provides long-haul bulk communications to DOD installations worldwide. Our EHF system is Milstar which is expected to provide survivable communications to critical command and control users worldwide. The survivability of these systems is dramatically different. [Deleted.]

In summary, DOD employs three generic satellite communications systems and [deleted] these systems plan to utilize survivable mobile ground control stations.

TACAMO

Senator QUAYLE. Are we doing all that can be done to upgrade existing TACAMO electronic gear on existing EC-130 to assure a amooth transition to the E-6A?

Mr. LATHAM. Yes. The EC-130 communications suite will be transferred to the E-6A when that airframe becomes available. To ensure a smooth transition, the communications suite from aircraft number 151888 will be transferred to an E-6A integration facility at Boeing when it comes out of service in late 1986.

EFFECT OF ASAT BAN ON ACTIVE ANTI-ASAT CAPABILITIES

Senator QUAYLE. How might an ASAT ban effect our ability to test or deploy active anti-ASAT capabilities? How important is having this active defense capability to provide a hedge against a Soviet ASAT breakout?

Mr. LATHAM. A comprehensive ASAT ban would completely negate our ability to test or deploy active anti-ASATs. Without having this active defense capability to provide a hedge against a Soviet ASAT breakout, we would give the USSR strong motivation to further deploy their already tested systems to prohibit U.S. use of space. Without this capability our warning, communications, intelligence and weather systems could be placed at risk.

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN

AIR DEFENSE FOR AMERICA

Senator LEVIN. Secretary Latham, in a recent Backgrounder entitled "Air Defense: Protecting America's Skies," an analyst writing for The Heritage Foundation wrote: "Ballistic missile defense is a vital component of any nuclear strategy based on moral values, but it is not enough. Air defense is essential. Without air defense, America will never escape the danger into which its own technology has delivered it." Dr. Latham, do you agree that without an air defense against Soviet bombers and cruise missiles carrying nuclear weapons, America will not be safe from nuclear weapons even if the President's Strategic Defense Initiative proves feasible and is deployed?

Mr. LATHAM. As long as the Soviets continue to deploy bomber- and cruise missile-delivered nuclear weapons, an air defense capability will be required for a comprehensive defense.

DEPLOYMENT OF AMRAAM

Senator LEVIN. The Air Defense Master Plan called for F-15s and F-16s to replace the F-106s and F-4s now standing air defense guard over American air space. An important component of making the F-16 more capable of air defense interception is the successful development of the Advanced Medium Range Air-to-Air Missile, or significantly shortened.

Yet the AMRAAM program has suffered from technical and schedule problems, which DOD addressed by restructuring it in a major way and greatly reducing initial procurement and production quantities of the new medium range missile.

Will the AMRAAM be ready for deployment when the first F-16s go on air defense duty? Will there be enough of them to equip properly the first F-16 air defense squadrons? Will air defense units receive AMRAAM before units designated for NATO warfare?

Mr. LATHAM. [Deleted.] The current beddown program which allocates AMRAAM missiles simultaneously to air defense and theater air superiority forces is being revised to elevate the priority of theater air superiority forces. The new priorities reflect the increased threat projected for enemy tactical air forces. The new beddown plan will not be finalized until the current planning cycle is complete at the end of fiscal year 1985. The numbers of missiles available for any particular mission area or theater will depend on the revised beddown plan.

SPARROW ON F-16'S

Senator LEVIN. If AMRAAM is not available, what provisions are being made to deploy a longer range missile with these aircraft? Is the Air Force going to vigorously accomplish a proposal to modify enough F-16's to carry the present generation medium range missile, the Sparrow?

Mr. LATHAM. As part of a review of AMRAAM cost reduction alternatives directed by the Deputy Secretary of Defense, we are currently examining potential alternatives if AMRAAM were not available. The incorporation of the AIM-7 Sparrow on F-16 A/B aircraft is a possible alternative, as is the AIM-7 incorporation on the F-16 C/D. Though the incorporation of AIM-7 capability is possible, it provides for less combat capability when compared to AMRAAM. These alternatives are being discussed with the Office of the Secretary of Defense; however, a final decision regarding incorporation of an AIM-7 capability on any F-16 has not been made.

F-16'S FOR AIR DEFENSE

Senator LEVIN. In the Heritage Foundation Backgrounder, dated September, 1984, the analyst—the Associate Director of Georgetown U.'s National Security Studies Program—also wrote:"The F-16, though less capable than the F-15, also represents a major improvement over existing air defense fighters." Would you agree with this conclusion?

Mr. LATHAM. Although the F-15 has areas of advantage over the F-16 in some aspects of the air defense mission, the F-16 is a marked improvement over the F-106s and F-4s that it is scheduled to replace. The F-16 has range and look-down capability greater than the current F-106 and F-4 air defense fighters.

LEADING EDGE ATTACK STUDY

Senator LEVIN. At the end of fiscal year 1985, the Air Force intends to deactivate the 87th Fighter Interceptor Squadron (FIS) at K. I. Sawyer AFB. That unit is on air defense alert with F-106s. The Air Force contends that an F-4 unit at Duluth, Minnesota will be able to cover the air defense sector now covered by K. I. Sawyer's squadron.

However, I understand that there is a new study by NORAD about the Soviet threat which shows that an F-4 unit at Duluth would not have sufficient capabilities to cover enough of this air defense sector—primarily because range limits of the F-4 mean those aircraft could not fly out far enough to close the gaps in our air defense radar coverage this new study indicates Soviet bombers might try to exploit.

Are you aware of this study now being briefed by NORAD to its air defense units—a study known as the "Leading Edge Attack" study? Please provide a copy of this study for the record.

Mr. LATHAM. A copy of this study, "North American Defense Against the Cruise Missiles (1986-1992) Phase 1, Soviet Leading Edge Attack Options)" will be provided to the committee. [Retained in Committee files.]

NORTHERN TIER AIR DEFENSES

Senator LEVIN. Would you agree that this study might indicate that instead of weakening our northern tier air defenses by deactivating the KI Sawyer unit, the AF should consider whether an alternative exists such as replacing that active unit with a detachment of air defense fighters forward deployed from an Air Guard unit, such as the air defense unit at Selfridge Air National Guard Base in Mt. Clemens, Michigan?

Mr. LATHAM. No. It is our opinion that we have not weakened northern tier defenses by deactivating the K.I. Sawyer unit. During the process of evaluating the deactivation of the 87th FIS at K.I. Sawyer, several alternatives were considered to insure that there would be no loss of defense capability. Changing the mission of the ANG unit at Duluth, MN, approximately 200 miles west of K.I. Sawyer, so that it could assume the air defense mission of the 87th FIS seemed to be the best answer. This beddown maintains the same number of squadrons along the northern tier as well as the same number of aircraft on alert 24 hours a day.

DEACTIVATION OF K.I. SAWYER UNIT

Senator LEVIN. The AF, in announcing the deactivation of the K.I. Sawyer unit, rejected the option of replacing it with a full Air Guard unit by contending the area population would not support adequate recruitment and retention. Yet I have been informed that the AF or the National Guard Bureau did a formal survey of the area population before reaching this conclusion.

Don't you think that such a formal study should be done, if the report to me is true, before such an option is dismissed, especially if a new threat study indicates that the alternative the AF has selected—Duluth's F-4 squadron—cannot provide adequate interceptor coverage?

Would you provide the committee with the results of such a survey if it was done and if it was not, why was the Air Guard unit option dismissed on that basis?

Mr. LATHAM. The Air Force has conducted no formal survey to determine the adequacy of the population surrounding K.I. Sawyer to support activation of an Air National Guard (ANG) unit. Demographic studies of this nature are performed by the respective reserve components. Inasmuch as there is currently no wartime requirement to establish an ANG air defense unit at K.I. Sawyer, a demographic study would not necessarily be warranted. Should future operational mission requirements change, rebasing of Air Force resources would be examined at that time.

FACILITIES AT K.I. SAWYER

Senator LEVIN. Deploying an Air Guard detachment for alert at K.I. Sawyer when the active squadron deactivates may never have been formally studied, however. The recruiting and retention requirements for such a detachment are less than for a full unit, and it could form the nucleus for building a sufficient target population for a full unit over 5 years.

I asked the Air National Guard in my state how they might propose to provide adequate air defense coverage in light of Duluth's deficiencies and the deactivation of the active unit. They responded with a proposal to deploy a detachment for alert at K.I. Sawyer—for minimal cost and within a very short time—by using facilities at K.I. Sawyer for which the base has no use, even when it gets more bomber or tanker aircraft.

Will the AF and DOD formally evaluate this proposal and assess its advantages and report back to me in response for the record whether it could provide the air defense coverage now lacking with the Duluth squadron?

Mr. LATHAM. The question you pose goes beyond the localized issue of an air defense detachment for K.I. Sawyer AFB. The Air Force is currently performing a series of studies which will compare our total programmed air defense forces to the projected strategic threat in the years 1986 and 1992. These studies, when complete, will provide the foundation for future decisions involving strategic air defense posture and could, ultimately, result in a redistribution of units, alert detachments, and defensive augmentation forces. A detailed report prepared by the 191st Fighter Interceptor Group, Selfridge ANG Base, Michigan, is retained in committee files.

DEPLOYMENT FROM SELFRIDGE

Senator LEVIN. Even though K.I. Sawyer will be able to make use of some of the deactivating unit's administrative space, it has no plans for the unit's alert facilities, which are too small for any aircraft but fighter size aircraft.

The relatively sparsely-populated areas around K.I. Sawyer also permit low level flight training which is not available as often as it should be to the F-4 air defense unit now stationed at Selfridge.

The Selfridge unit also already is supporting an alert detachment at Seymour-Johnson AFB in North Carolina. It thus has excellent experience in successfully operating such a forward deployed air defense detachment.

Wouldn't deploying another F-4 detachment from Selfridge to K.I. Sawyer permanently after the active unit deactivates make the best use of this experience, of the taxpayer's investment in the existing facilities at K.I. Sawyer, give the parent unit a new low level training area, and increase our air defense coverage against the Soviet threat?

Mr. LATHAM. Possible increases in air defense coverage to counter the Soviet threat need to be evaluated on a nationwide basis rather than using a regional approach. This method insures the nation gets the greatest payoff per additional dollar spent on air defense. The Air Force is currently performing a series of studies which will compare our total programmed air defense forces to the projected strategic threat in the years 1986 and 1992. These studies, when completed, will provide the foundation for future decisions involving strategic air defense posture and could ultimately result in a redistribution of units, alert detachments, and defensive augmentation forces. Results could be provided, on a classified basis, when the studies are complete.

HIGH LEVEL SATELLITES

Senator LEVIN. Some of our most sensitive C^3 assets are in high level satellites. If such limits could be adequately verified, wouldn't it reduce the threat to them if we could negotiate limits on high level ASATS with the Soviets? Even if we could not restrict all the threats, or even all the high level threats, on the basis of verifiability (and this remains uncertain) wouldn't it be better to reduce the threat to these valuable assets in this way?

Mr. LATHAM. [Deleted.] To provide comprehensive protection to US high-altitude space assets, an ASAT agreement would need to address each of these potential threats. Compliance with such an agreement would be extremely difficult to monitor with reasonable confidence. However, the United Staters is continuing to study space arms control, in search of selected limits on specific types of space systems which are verifiable and which support U.S. national security objectives. In the meantime, the United States is investigating a variety of means for improving the survivability of space systems against a broad spectrum of potential Soviet ASAT measures.

UPGRADE OF STRATEGIC C^3 SYSTEMS

Senator LEVIN. Since the 1979 Strategic Connectivity Study identified weaknesses in our strategic C^3 systems, Congress has appropriated billions of dollars for improvements—even before the Reagan Administration took office. How much more survivability, and endurance, and message transmission capabilities have we gained since then? Provide a 1979 chart and one for 1985 showing the effects of upgrades. How much more will we gain from the fiscal year 1986 budget request in this area? If these improvements are not significant, when will we see major gains, and why will it take that long?

Mr. LATHAM. The Air Force has completed many improvements to our C^3 networks since 1979 enhancing the survivability and endurance and increasing message transmission capabilities. Improvements being pursued for space systems include such things as autonomy, proliferation, [deleted] nuclear effects hardening, and cross linking. For the modernized command systems, including airborne terminals and command posts, emphasis is being placed on proliferation, interoperability, mobility, and nuclear effects hardening. Communications links are being improved with jam-resistance, encryption, direct downlinking, and frequency optimization. A comparison between 1979 and 1985 for some of our major operational systems is shown in the following four charts. The fifth chart depicts key milestones for systems under development which, when operational, will ensure survivability and endurance into the next century. Following the charts is a brief description and status of each of our major efforts.

OPERATIONAL SYSTEMS—1979 V. 1985

	1979	1985 [1]
Defense Satellite Communications System[DSCS]:		
Electromagnetic pulse [EMP] hardened	Yes	Yes.
System generated EMP hardened	No	Yes.
Underground nuclear test verification	No	Yes.
Jam-resistant communications:		
Narrow coverage steerable beam	Yes	Yes.
Jammer locating capability	No	Yes.
Jammer nulling capability	No	Yes.
Spread spectrum terminals	No	Yes.
Spacecraft control:		
Jam resistant beacon	No	Yes.
Jam resistant control	No	Yes.
Proliferated ground control segment	No	Yes.
E–4B Airborne command post:		
Number of aircraft with following improvements:	[2] 1	4
Aircraft EMP hardened		
-Superhigh frequency satellite terminal		
-AUTODIN		
-AFSATCOM connectivity to all elements		
-Improved secure voice		
-200KW very low frequency transmitter		
Superhigh frequency Single Channel Transponder	No	Yes.
Injection System capability		
Automatic data processing	No	Yes.
Additional secure voice devices to secure data and voice traffic including KG–84's, Vinson (KY–58)and Parkhill (KY–75).	No	Yes.
Endurability improvements:		
Weather radar	No	Yes.
Improved engines	No	Yes.
EC–135 Airborne command post:		
AFSATCOM	No	Yes,
Automatic data processing	No	Yes.
High frequency radios	Old	New.
616A very low frequency modulator/demodulator	No	Yes.
Transverse electric antenna modifications	No	Yes.
Vinson secure voice	No	Yes.
Parkhill secure voice	No	Yes.
New ultrahigh frequency [UHF]/frequency/division multiplier	-	On contract.
EMP protection program	No	Yes.
Increased AFSATCOM access (Flaming Arrow net)	No	Yes.
SAC automated command and control system [SACCS]	Old, becoming unsupportable. Partly unsecure.	New keyboards/printers fielded. SACDIN being tested/deployed. Fully secure.
Command centers	Non-EMP hardened	Steel rooms constructed at National Military Command Center, SAC, NORAD and to selected equipment at Alternate National Military Command Center [ANMCC]. EMP hard.
	No AFSAT secure voice	Capability installed at NMCC, SAC, and NORAD.
	No automatic improved message handling.	Interface scheduled.
High frequency [HF] radio stations	Old, becoming unsupportable	Scope Signal III underway. New, reliable, state-of-the art equipment installed and operational at five of nine sites.

[1] One satellite on orbit

[2] Development completed in December 1979. Aircraft delivered to SAC January 1980.

SYSTEMS UNDER DEVELOPMENT

	Fiscal year—		
	Start FSD	IOC	FOC
Milstar	1983	[Deleted]	[Deleted]
SAC digital network [SACDIN]	1981	1986	1987
Aircraft alerting communications EMP [AACE]	1985	1986	1988
Minimum essential emergency communication network [MEECN]:			
Diversity receive equipment [DRE]	1982	1990	1992
Miniature receive terminal [MRT]	1985	1989	1995
Ground wave emergency network [GWEN]	1983	1986	1990

Upgrade of Strategic C^3 Systems

DEFENSE SATELLITE COMMUNICATIONS SYSTEM [DSCS]

In 1979, DSCS II provided the majority of wideband communications for the Defense and State Departments. DSCS III was in the middle of Full Scale Development and would offer major improvements in nuclear hardening, jam-resistant communications and more survivable, jam-resistant satellite control. The first DSCS III was launched in 1982. Thirteen additional DSCS III's are now under contract, the last seven of which are part of a multiyear contract. The fiscal year 86 program acquires two of the multiyear procured satellites (satellites 8 and 9) and also continues the deplcyment of jam-resistant, spread spectrum communications terminals. Planning and development will start for two unique DSCS communication networks. The Army will upgrade the Ultrahigh Frequency (UHF) Flaming Arrow network to provide a Superhigh Frequency (SHF) receive capability and the Air Force will upgrade its UHF—Air Force Satellite Communications (AFSATCOM) terminals at ICBM Launch Control Centers to have an SHF receive capability. The SHF systems will be significantly more jam-resistant and perform better in a nuclear environment than UHF. These systems will serve as an interim improvement until Milstar is fully operational. However, wideband, high data rate users will continue to depend on DSCS III.

WORLD WIDE AIRBORNE COMMAND POST [WWABNCP]

Major changes in the aircraft configuration have occurred in the last five years for both the E-4 and the EC-135 airborne command posts. Paramount among these is the completion of the E-4B production modification. The modifications are listed in the previous charts. Several modifications are scheduled with fiscal year 86 funding including SHF Single Channel Transponders and upgrade to add KG-84 crypto devices.

SAC AUTOMATED COMMAND AND CONTROL SYSTEM [SACCS]

The Air Force has undertaken to replace the obsolete SACCS, a 1950's vintage record communications system which SAC uses to transmit Emergency Action Messages (EAM) and force status information. Under the SAC Digital Network (SACDIN) program, new communications switches and terminals will be installed at 135 locations. In the early 1980's we replaced the old SACCS input/output devices with new SACDIN-compatible keyboards and printers. The SACDIN program itself is in limited production leading to Feb 86 Initial Operational Capability (IOC) and 1987 Final Operational Capablity (FOC). The fiscal year 86 budget request supports continued deployment of SACDIN.

COMMAND CENTERS

Emphasis in the last several years has been on survivability, both physical and EMP. [Deleted.] For EMP survivability, we have constructed EMP-protective shielding rooms to house critical communications equipment at the National Military Command Center, HQ SAC, and HQ NORAD (Cheyenne Mountain Complex). With the Aircraft Alerting Communications EMP (AACE) Upgrade, the Air Force will EMP harden all twenty-four of SAC's Aircraft Wing Command Posts. AACE is in

full-scale development leading to a 1986 IOC and 1988 FOC. The fiscal year 86 budget request supports the initial procurement of AACE.

HIGH FREQUENCY [HF] RADIO STATIONS

The Air Force is modernizing the worldwide HF radio network which CINCSAC uses for real-time command and control of his forces. Under the Scope Signal III program, out-moded HF radios and antennas are being replaced with state-of-the-art equipment. Four of nine sites remain to be upgraded. The fiscal year 86 budget request supports continued procurement and installation of Scope Signal III.

MILSTAR

The fiscal year 86 budget request supports the production of over 300 force element UHF satellite terminal upgrade kits and the Full Scale Development of the Milstar spacecraft and Extremely High Frequency (EHF) terminals. The upgrade kits will allow immediate use of the on-orbit Single Channel Transponder, providing significantly improved satellite Emergency Action Message (EAM) dissemination in a nuclear scintillation and electronic jamming environment. By fiscal 89 over 780 of these improved UHF terminals will be installed in ground and airborne locations worldwide. The Milstar program will hold a spacecraft Critical Design Review in fiscal 86 and will fabricate its first EHF terminals. [Deleted.]

MINIMUM ESSENTIAL EMERGENCY COMMUNICATION NETWORK [MEECN]

MEECN provides the National Command Authorities with a means of assured emergency action message transmission and reception during the pre-, trans-, and post-attack periods of strategic conflict. The Air Force support to the MEECN system has centered around improving existing communication systems as well as developing new systems such as the Transverse Electric Receive Antenna, Diversity Receive Equipment (DRE), Miniature Receive Terminals (MRT), and the Ground Wave Emergency Network (GWEN). The Transverse Electric Receive Antenna was developed and is currently being installed in the Airborne Command Post aircraft. This antenna will provide a new VLF/LF reception capability that results in increased range. It also provides improved reception capabilities of VLF/LF signals in a nuclear disturbed environment and areas subject to day/night inversions phenomena. The DRE and MRT will also take advantage of the TE antenna and are designed to be EMP hard. This will permit communications during trans- and post-attack periods. The equipments will also be [deleted] and incorporate the MEECN Message Processing Mode (MMPM). MMPM will permit significant reductions in transmission times and will be interoperable with the Navy portion of the VLF/LF system.

The GWEN program will use a series of proliferated relay stations, receive only stations, and input/output terminals to ensure EMP hardened strategic communications during pre-, trans-, and post-attack periods of a conflict. This system will ensure that the bombers and tankers can receive the positive control launch message and that EAMs can be delivered to the missile launch control centers.

COST OF AIR DEFENSE NETWORK

Senator LEVIN. Former SecDef Schlesinger estimated such a necessary air defense network would cost at least $50 billion to establish and billions more annually to operate. Do you agree with these estimates; do you have your own estimates of how much it would cost and what systems would be needed (in terms of numbers of aircraft, radars, people, etc.)? If not are you doing such an estimate, since the present Air Defense Master Plan did not envisage such a comprehensive air defense network?

Mr. LATHAM. At this time we estimate the required cost for supporting the Air Defense Master Plan (ADMP) to be approximately $7B. However, the ADMP is currently being updated by its long-range planning annex, the Strategic Defense Architecture (SDA) 2000. As a planning guide, SDA 2000 provides an evolutionary approach to the improvement of North American air defense and a basis for future DOD planning, programming and budgeting efforts. It constitutes the first step of a strategic defense planning process that will result in an overall architecture supporting our strategy for deterrence through the turn of the century. The SDA 2000 study is currently on-going with a draft completion date estimated for late summer 1985 and a final completion date yet to be determined. No estimates concerning acquisition costs, manpower requirements, or operations and maintenance costs will be available until this study is completed.

AIR DEFENSE UPGRADES

Senator LEVIN. The Air Defense Master Plan itself was predicated on annual procurement levels for F-15 and F-16s which have not been realized. These programs still will be put back, in all likelihood. How has this delayed the air defense upgrades; what plans exist for maintaining our defenses with older aircraft if the newer aircraft are not available as expected?

Mr. LATHAM. The DOD North American Air Defense Master Plan called for the modernization of five active F-106 squadrons with F-15s by fiscal year 1987. Reduced F-15 procurement caused the conversion of the 87th FIS at K.I. Sawyer to be canceled and the squadron to be deactivated. The last of the four remaining squadrons will be equipped with F-15s by the end of fiscal year 1986.

Modernization of the remaining squadrons was not addressed in the Master Plan. However, the Air Force intends to equip the units with newer aircraft. In fiscal year 1987 the squadrons at Jacksonville, FL and Otis ANGB, MA will have their F-106 aircraft replaced with F-16As.

Senator THURMOND. Mr. Latham, I think that completes our hearing.

I want to thank you for your appearance here. You have been very articulate in presenting it.

We stand adjourned.

[Whereupon, at 12 noon, the subcommittee adjourned, subject to the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1986

WEDNESDAY, MARCH 13, 1985

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

THEATER NUCLEAR FORCES

The subcommittee met in executive session, pursuant to notice, at 9:09 a.m., in room SR-222, Russell Senate Office Building, Senator Strom Thurmond presiding.

Present: Senators Thurmond, Goldwater, Hart, and Glenn.

Staff present: Robert F. Bott; Douglas R. Graham; John J. Hamre; George K. Johnson, Jr., professional staff members; Russell C. Miller, research assistant, and Karen A. Love, staff assistant.

Also present: Gerald J. Smith, assistant to Senator Goldwater; James M. Bodner, assistant to Senator Cohen; Allan Cameron, assistant to Senator Denton; Janne E. Nolan, assistant to Senator Hart; Jeffrey B. Subko, assistant to Senator Exon; and Phillip P. Upschulte, assistant to Senator Glenn.

Senator GOLDWATER. The meeting will come to order.

Our witnesses today are Richard N. Perle, Assistant Secretary of Defense for International Security Policy and Dr. Richard L. Wagner, Assistant to the Secretary of Defense for Atomic Energy. I understand you have representatives with you from each of the forces.

Mr. Perle, why don't you begin?

STATEMENT OF HON. RICHARD N. PERLE, ASSISTANT SECRETARY OF DEFENSE FOR INTERNATIONAL SECURITY POLICY

Mr. PERLE. Thank you very much, Mr. Chairman, and thank you for inviting us here this morning. I would like to say just a few words about tactical forces.

Dr. Wagner has some detailed information to present to you, and he is our expert on the programs to which this hearing is devoted.

I would just like to say a few words about the importance of our theater nuclear forces in our overall strategy, and I would like to touch briefly on some of the controversy that has developed about those forces because it seems to me important that we not get caught up in what I believe are some misunderstandings about the shorter range forces that we deploy, principally in Europe.

Let me say first that it has always been our view since the evolution of NATO strategy into the document developed in the 1960's called MC-14/3, the basic guidelines for NATO policy, that the North Atlantic Alliance ought to maintain a full spectrum of deterrent capability ranging all the way from conventional forces at one end to strategic nuclear forces at the other.

The intermediate-range nuclear forces and the short range nuclear forces occupy a critical portion in the center of that spectrum of deterrence. It is in that area that we have seen a dramatic growth of Soviet forces in recent years, and it is in that area that we have begun now to remedy the imbalance that resulted from that growth of Soviet forces by the initial deployment of Pershing II and ground-launched cruise missiles on the territory of our allies in Europe.

As you know, the decision to initiate that deployment was taken in December 1979 by all members of NATO at a special meeting of defense and foreign ministers, and one of the great challenges that this administration faced in its first term in office was to implement that policy of a prior administration in the face of massive protests and heated debate in virtually every country in Europe, and a debate around which elections turned in at least one or two of the countries receiving those weapons.

I am happy to report that the deployment program is on schedule, is proceeding as we had planned it to proceed, and with the exception of a little difficulty here and there in one place or another because there is continuing opposition, particularly among opposition parties to the deployment of Pershing II and ground-launched cruise missiles, we are implementing the NATO decision of December 1979 and that under the circumstances is no small achievement.

GENEVA NEGOTIATIONS

We are also, as you know, negotiating for a regime of limitation on these forces in Geneva, talks that began again just yesterday. Our view has been that if the Soviets would be prepared to abandon their intermediate-range nuclear forces, their SS-20's in particular, we would be prepared to terminate our program and withdraw from Europe anything that had been deployed on the date on which agreement was reached, the so-called zero option. The Soviets, as you know, have rejected that, and in the previous round of negotiations with us, they made a succession of proposals that really amounted to variations on a single proposal, all of which had the same bottom line, and that was zero for the United States and a significant number of launchers for intermediate-range nuclear missiles for the Soviet Union, and I trust that as this new round of negotiation proceeds, we will not lose sight of the bottom line, which is, what does it permit the United States and what does it permit the Soviet Union.

And I think if past history is any guide, we will find zero on our side of the equation in the Soviet proposals.

SHORT-RANGE SYSTEMS

The short range systems, systems like Lance and nuclear artillery, have not received nearly the attention of the intermediate-range forces which, because of the political controversy surrounding them and the negotiations, have occupied the attention of most allied governments for the past several years. And yet a great deal of work has been going on with respect to shorter range systems, and some controversy has begun to develop there.

So I would like to take just a couple of minutes, and then I will conclude, to make a couple of comments about these shorter range systems.

Let me say first that short-range systems, so-called battlefield systems, have a vital but not very well understood role to play in enabling. the NATO alliance to carry out a conventional defense strategy. Now, this may seem ironic, and it certainly isn't self-explanatory, so let me explain.

BATTLEFIELD NUCLEAR FORCES

The Soviet Union, from everything we know about their preferred method of fighting, their strategy and their doctrine for offensive operations in Europe, would dearly love to mass its superior fire power in order to break through NATO lines. And I believe that in the absence of a nuclear threat which is posed to those Soviet forces by the presence on the battlefield of short range nuclear weapons, the Soviets would optimize the use of their forces precisely in that manner, to mass them for a decisive breakthrough along lines that NATO cannot hold simply with conventional forces.

But because we have battlefield nuclear forces, because every Soviet commander knows or should know that his troops may come under nuclear attack, the Soviets have responded to that threat by dispersing their forces, in short, by not taking advantage of their significant capability in fire power and armor, in order to protect those assets in the face of a nuclear threat.

So the first and most important consequence of the possession by the alliance of battlefield nuclear weapons is that the Soviets are unable to implement their most effective battlefield tactics and to capitalize on their greatest asset, which is their superior fire power.

So these nuclear weapons contribute in a fundamental way, in a way that is not very well understood, to NATO's ability to fight a conventional war, and they therefore, in my judgment, significantly raise the nuclear threshold over what it would be in the absence of that capability.

And second, if one looks at the emphasis the Soviets place on attempting in wartime to neutralize NATO's nuclear forces, I think it is clear that a significant fraction of the capability the Soviets would need to drive forward into Western Europe will be diverted to the purpose of attempting to neutralize NATO's tactical nuclear forces, and that inevitably will blunt the effectiveness of their initial invasion.

And for this reason, too, we believe that the presence on the battlefield of appropriate tactical nuclear weapons strengthens greatly NATO's ability to fight a conventional war.

Needless to say, we desire these weapons also to counter the fact that the Soviets have similar weapons, and we would like to retain control of the escalation process because NATO's strategy depends on it, so that control of that process does not fall into Soviet hands by virtue of their possession of a vastly superior tactical nuclear force.

Now, in order to accomplish these important purposes, I believe that we need to have not an antiquated but an appropriately modernized tactical nuclear force, and we have begun that process. We are presently producing greatly improved 8-inch nuclear rounds. We will also, if the Congress continues to support the program we have embarked upon, modernize the 155mm howitzer rounds, and I want to take just 1 minute on the 155mm program because, it was at one point deleted from the administration's request; subsequently it was restored; it could become controversial yet again.

Without a program to modernize the 155mm rounds, that is, if we modernize only the 8-inch rounds, which has never been controversial, the United States will find its tactical nuclear capability, its battlefield capability, in the short-range systems limited to the roughly [deleted] 8-inch artillery tubes in Europe. Those [deleted] artillery tubes are grouped [deleted].

We have, by contrast, [deleted] 155mm tubes in Europe, and [deleted] they have an overwhelming task in attempting to target and destroy that battlefield capability.

So we think it is vital to proceed with the production not only of the 8-inch round, which could be fired from some [deleted] in Europe, but with the 155mm round as well which could be fired from [deleted] in Europe.

A compromise between the original executive branch proposal and the Congress has thus far been worked out, and I must say, after having watched the process from the other side of the table for 12 years, I think the compromise that has been worked is a model of cooperation between the executive and legislative branches.

The executive branch proposed a 155mm program that was large and costly, and I think I now too am persuaded that it was larger and costlier than it needed to be. The Congress initially deleted all of the funding for the 155mm program, and we began a round of discussion principally with Senator Nunn who had offered the legislation to delete the 155mm program, and Senator Johnston, who had followed suit in the Appropriations Committee. And we ultimately came to a consensus that a smaller and much cheaper program would suffice. And so we have literally cut in half the cost of the original administration program for building modernized artillery rounds, and yet in doing so, we have managed to preserve enough of a 155mm program and enough of an 8-inch program so that we can achieve those important benefits that I was describing a moment ago, and in particular, so that we can hold Soviet forces at nuclear risk across the entire front of the battle and thereby improve our capacity to fight a conventional war.

I very much hope that this subcommittee will sustain that compromise and permit that program to go forward as it is now planned on a greatly reduced but we believe adequate scale.

Mr. Chairman, that is all that I have to say. If I can be helpful in responding to any questions, I would be glad to do so.

Senator THURMOND [presiding]. Thank you very much.

Dr. Wagner, do you want to proceed? Then we can come back and ask questions of you both after you have finished.

STATEMENT OF HON. RICHARD L. WAGNER, JR., ASSISTANT TO THE SECRETARY OF DEFENSE FOR ATOMIC ENERGY, AND CHAIRMAN, MILITARY LIAISON COMMITTEE TO THE DEPARTMENT OF ENERGY, ACCOMPANIED BY BRIG. GEN. SIDNEY DAVIS, USA, DIRECTOR, NUCLEAR AND CHEMICAL DIRECTORATE; BRIG. GEN. ROBERT F. DURKIN, USAF, DEPUTY DIRECTOR OF OPERATIONS (DCS PLANS & OPERATIONS); CAPT. ELTON C. PARKER, USN, HEAD, THEATER NUCLEAR PLANS, POLICY AND REQUIREMENTS (NAVOP 653)

Dr. WAGNER. Thank you very much, Mr. Chairman. I have a statement for the record which I would like to submit but not read.

Senator THURMOND. Without objection, it will be printed in the record.

Dr. WAGNER. Thank you very much.

Mr. Chairman, I need to ask whether this hearing is closed because what I have to say will contain classified information.

Senator THURMOND. It is closed.

Dr. WAGNER. Thank you.

I would like to say also a word to commend the format of this hearing in its relationship to the hearings that this subcommittee will conduct tomorrow on the Department of Energy's nuclear weapons budget. It is particularly helpful to us to be able to discuss the DOD aspects, systems aspects, of the joint programs that we have with the Department of Energy in the format of this kind of hearing so that the Department of Energy hearing itself, which will be tomorrow afternoon, can concentrate more on the tech base and the overall health of that program.

Often in the past those two things have become confused, I think to the detriment both of the program and, I suspect, of your understanding of it. So I think this is a good format.

SHORT-RANGE SYSTEMS

I intend to just say a word or two more about the short-range systems, in particular, the artillery systems, to amplify a bit on what Mr. Perle just said, and then to describe a closely related subject which this committee has shown an interest in in the past, and that is the security and the related subject of the survivability of the weapons in Europe. It has been a difficult matter for us, and we are making some progress, but we have a way to go, and then finally, to conclude with a few comments about the modernization of the Navy's fleet nuclear stockpile which is also, I think, a much misunderstood and sometimes controversial subject.

On the question of the short range systems, for NATO in particular, Mr. Perle commented on the basic purpose of those systems. I

would like to address one or two other points. The short-range systems are sometimes criticized on what to me are two specious grounds. One of those criticisms is that the artillery is so far forward that it is subject to being overrun and the nuclear weapons lost.

Let me say that over the history of these kinds of systems, artillery, despite the fact that it is relatively far forward, is a quite survivable entity on the battlefield. It is mobile. It does not have a large and particularly unique signature. And as Mr. Perle said, there are many tubes, so that from the point of view of the survivability of the nuclear capability, it is quite robust, I think.

The other criticism that is sometimes leveled at the short-range systems is that they put the start of a nuclear war in the hands of a low level commander. That could not be farther from the truth. The release, the nuclear release procedures and policy are just the same for the short-range systems as they are for any of the longer range systems. The President must authorize the release and use of these systems. The nuclear control orders proceed down through the echelons of command in just the same way. There are what we call permissive action links, sufficient combination locks in effect built into the weapons. They cannot be fired until those locks are unlocked and the combinations in effect of the locks have to be transmitted to the commander from higher authority.

So it is simply not true that a battalion commander can start a nuclear war with the short-range systems. The compromise that Mr. Perle referred to and which had been worked out by several of us, is embodied in the divisions on this viewgraph.

SEC. 1635 DOD AUTHORIZATION ACT, 1985 (PL 98-525, 19 OCT 84)

"AUTHORIZATION FOR PRODUCTION OF THE 155MM ARTILLERY-FIRED ATOMIC PROJECTILE"

$50M authorized for DOE facility construction.
Total W79 and W82 may not exceed 925.
Total DOE production funds after 19 Oct 84 may not exceed $1.1B for both AFAP.
AFAP must be produced NON-ER after 19 Oct 84.
SECDEF must submit a plan to Congress to implement.

The act last year authorized $50 million for the Department of Energy facility construction, and that the total quantity of the two types of rounds, the W-79 8-inch round and the W-82 155 should not exceed 925, that the total production funds after the date of enactment should not exceed $1.1 billion for both types of rounds. The rounds must be produced in the non-enhanced radiation mode after that date, and that the Secretary of Defense must submit a plan to Congress to implement these provisions before we could proceed.

A couple of months ago the Secretary did in fact submit that plan to the Congress which, in addition to simply saying that we will comply with those provisions, spoke to the mix of the two types of rounds.

SECDEF PLAN TO CONGRESS

DOD and DOE will produce 925 modernized nuclear projectiles. [Deleted.]
Warheads produced after 19 Oct 84 will be non-enhanced radiation version.
DOE production funds will be within $1.1B limit. [Deleted.]

[Deleted.]

I should say that given the fact, for the reasons that Mr. Perle mentioned, that we feel we need the 155mm round is this split between the two, there is not much flexibility in arriving at that split. It did not require a long and detailed study for us to arrive at it, for the following reasons. [Deleted.]

[Deleted] but in fact the purpose, as Mr. Perle said, of the combined deployment is to present such a large number of potential aim points to the Soviets, whose doctrine is in fact to try to attack our nuclear systems, that it is not so much the number of nuclear rounds and the split between them that counts as much as the number of total tubes, and that is unaffected by the split since we will qualify all or virtually all of the tubes for support of these nuclear capabilities.

We will not, of course, according to the provisions of the act, produce any more enhanced radiation weapons. [Deleted.]

[Deleted.]

[Slide deleted.]

I have one final point on the 155mm. It is not only the ability to access a much larger number of cannons for survivability purposes that causes us to need to produce the new 155mm; the new round itself has considerably improved capability.

[Deleted.]

Perhaps most important is that the range is twice as great. The old round can only be fired out to about [deleted]. The new round could go out to about [deleted], which allows us to have an equivalent range to Soviet artillery and perhaps also to be able to stand back somewhat further for even greater survivability.

Then, finally, while it is not on this chart because it is hard to quantify in bar graph form, the W48 was designed to safety standards of the 1950's. The W82, the new round, is designed to modern safety standards and has security features in it which enhance its deployability and capability [deleted].

If I may, then, I would like to turn with that lead-in to the question of survivability and security, to the topic of the survivability and security of nuclear weapons in Europe as a whole, not only the artillery shells.

This has been a matter of some controversy now for about 10 or 12 years, since the rise of international terrorism and voiced concerns both in the United States and by our allies as to the security of the weapons against a terrorist attack on the storage sites. We are operating under a fundamental handicap with regard to the security of the weapons, in that the facilities in which they are stored were built back during the 1950's and early 1960's against criteria for security that did not envision at all the kind of terrorist threat that we now believe we should provide against, that is, [deleted]. The storage sites were designed in the 1950's largely to protect the weapons against one or a few individuals, perhaps insiders, perhaps psychotics, who would gain access covertly to the weapons. The storage structures are essentially World War I or World War II ammunition igloos which were designed more for conventional explosive safety purposes than for nuclear weapons.

A typical storage site today in Europe looks like what is shown on the next Vu-Graph.

[Slide deleted.]

I realize that is probably pretty dim. [Deleted.]

In 1972, when the magnitude of the terrorist problem was exposed at the Munich Olympics, it was really that event that provided the impetus for the program that I will describe in a minute. [Deleted.]

LONG RANGE SECURITY PROGRAM

During the couple of years between 1972 and 1974, some quick-fix measures were taken, sandbag fighting positions were put into place, the security forces were augmented, and in about 1974 a comprehensive program to upgrade the security of these sites was undertaken called the LRSP, the Long Range Security Program. That program has taken what to me is an inconscionably long time for NATO to complete. It is now nearly complete. It consists of bringing the sites up to the standards.

Again, I realize you can't really see them in this chart, but hardened guard facilities, hardened towers, better lighting, and fences that have been replaced and made more effective, and an electronic intrusion detection system around the perimeter of the site, and some other things that I will not list in detail.

The civil construction portion of that program has essentially been completed now. For most of the over [deleted] that program is complete, and the sites now look as this site looks. For the sites for which the funding was prefinanced by the United States, instead of relying on NATO funding, [deleted]. There are about [deleted] today, however, which were funded by NATO for that [deleted] and in what to me, if it weren't such a tragic situation, would be almost comical, it has taken 7 or 8 years for that program to get to the point where it is today, which is that there is finally an acceptable design, a reliable design for the intrusion detection systems. And a demonstration site is being built. It is nearly complete now. And when it has been accepted by the NATO authorities, the other [deleted] will be constructed, with projected completion in [deleted].

When that program is complete, the security will be up to the standards that were thought to be required in the mid-1970's when the program was started. In about 1980, however, we in the United States did some tests against these upgraded sites with all the features that I have just described, using U.S. Special Forces to simulate a terrorist group attacking the site, perhaps a worst case simulation, but nevertheless, I think we have to be concerned with it and very conservative about it.

What it showed was that a [deleted].

Now, I think that in fact a terrorist group would be deterred from making such an attack on the site by the prospect of these response forces. There are about [deleted] according to the requirements.

WEAPON ACCESS DELAY PROGRAM

And so 3 years ago the Congress allowed us to prefinance a program for the European sites which we call the weapon access delay system [WADS], and it involves building in through these igloos a set of devilish devices that I will show in this next slide, a cutaway drawing.

[Slide deleted.]

Here is a cutaway of an igloo. These would typically be [deleted] inside the igloo. What this program does, a WADS program, is it puts [deleted].

This program is going to be completed [deleted] and in fact, I should say we went out on a quite urgent basis to [deleted] sites, in particular, sites in [deleted] and put these things in on a crash basis. That program will have cost about $35 million, which in my view is one of the best buys that the Congress has ever allowed us to undertake. In fact, what it does I think is set a pattern for the future which is that further improvements along these lines of the kind that I will talk about in a few minutes should really be carried out with U.S. prefinancing so that we can be about the programs and get them done quickly and not have to wait a decade for the NATO financing to come along and be arranged.

Now, so far, all of these improvements that I have shown are addressed to the problem of peacetime security against terrorists. As Mr. Perle said, it is clearly a part of Soviet doctrine, and it is one of the penalties, in fact, that the presence of these weapons in Europe would impose on the Soviets in contemplating a war. It is their doctrine to attack our nuclear weapons storage sites and the nuclear weapon delivery systems so that we cannot pose the threat to them that the weapons pose. These sites are, as you saw in the Vu-Graph [deleted].

So we have begun to put together what we hope will be a comprehensive long term program to revise the storage posture of the nuclear weapons [deleted] to provide both resiliency against further developments that we don't think we can anticipate today of the terrorist threat in peacetime, and also to make the weapons more survivable.

Let me just take a minute to describe those developments.

[Slide deleted.]

The first in the sequence of those developments is what we call the weapons storage vault [deleted]. These vaults are designed or were invented and designed by Sandia Laboratories, the Department of Energy, back actually during the late 1970's for just this purpose. They have the same kinds of [deleted].

[Slide deleted.]

That system is shown in a little larger scheme here.

[Deleted.]

[Slide deleted.]

About 2 years ago the Defense Nuclear Agency did a test which was partly a safety test and partly a survivability test in which they blew up one of those hardened aircraft shelters with the [deleted].

Now, some often say what good is it to have the weapons survive [deleted].

Now, this program that we are in the early stages of laying out would essentially bring this same kind of technology to all the weapons [deleted].

[Slide deleted.]

[Deleted.]

[Slide deleted.]

We are also starting a program which will actually be completed rather soon, I think in [deleted].

[Slide deleted.]

[Deleted.]

Senator HART. Mr. Wagner, would you put the truck slide back on, please?

Dr. WAGNER. Yes.

Senator HART. Is that essentially the same kind of truck that tipped over in Denver last year?

Dr. WAGNER. I do not remember that incident. I doubt it actually because I do not remember a nuclear weapons shipment having tipped over.

Captain Parker, do you remember?

Captain PARKER. Those were conventional torpedoes.

Dr. WAGNER. A truck filled with conventional torpedoes. It is the same kind in the sense that it is much like a regular 18 wheeler, it can tip over. The drivers are pretty good, and we have never had an incident, as far as I know, like that with nuclear weapons. However, I should say that the weapons themselves are safe and getting safer as we deploy weapons that have insensitive high explosives rather than conventional high explosives. So a system like this if it tipped over, it would be an embarrassment, clearly, but I think, frankly, that there would not be a safety hazard.

Senator HART. The only reason I asked is because that was a private contractor. They were conventional torpedoes, and I think the contractor was a woman who was on her second trip, and it took the military, I think, about 6 or 8 hours to respond.

Dr. WAGNER. [Deleted.] The guards that guard these are pretty darned good. They train with this laser equipment that is mounted on small arms, rifles and submachineguns, which allows them to train very realistically. It is almost as if you were using live ammunition. They do it pretty frequently, and they are pretty tough.

So I think that there is a good response capability for nuclear weapons shipments, and in fact, we are beginning to use that same kind of training technique for the guard forces. We have been for several years for the nuclear weapons storage guard forces in Europe.

Senator GLENN. Mr. Chairman, let me ask, are there other vehicles accompanying that, or is that the sole vehicle?

Dr. WAGNER. [Deleted.] It is a pretty clever gadget.

That was all I had planned to say on the site security forces, and the security and survivability upgrades.

I would like to conclude with just a couple of minutes on the upgrade of the Navy, the Navy theater or fleet nuclear weapons, and I would like to preface that by showing this chart——

[Slide deleted.]

Which shows the average age of all the warheads in the stockpile grouped according to the type of the force structures.

[Deleted.] It was quite old at the time of its retirement. The strategic offensive forces, of course, we have turned that stockpile over with the upgrading from Minuteman II to Minuteman III, and so forth, so that the aging of the strategic offense, the red line here, has not been as severe a problem as it is for the other two components, the tactical weapons and in particular the fleet weapons.

Excluding the submarine-launched ballistic missiles, the fleet weapons including the strike weapons, the fleet air defense weapons, and the fleet antisubmarine warfare weapons were essentially all built back during the 1960's, and the stockpile has aged [deleted] since that time.

[Deleted] the Navy undertook a quite extensive program to modernize the fleet stockpile. To do that involved really rebuilding an infrastructure in the Navy, training officers who had not been involved in the nuclear weapon development interactions with the DOE for 20 years, building up a systems analysis capability to understand the requirements for these kinds of weapons. I think the Navy has done a remarkable job [deleted] in rebuilding that capability, and now have what I view as a quite [deleted] program to modernize the fleet weapons.

STRIKE WEAPONS AND FLEET DEFENSIVE WEAPONS

They come in two categories, strike weapons and fleet defensive weapons. The purposes of the strike weapons are fairly clear. They serve in some ways the same sorts of deterrent functions as any of our other nonstrategic nuclear weapons. There are the naval version of the Tomahawk land attack missile, the TLAM/N, a deployment of which you are familiar with, and the modernized bomb for aircraft delivery from aircraft carriers, [deleted]. Those two deployments have been underway for a few years, and are not the ones that are particularly controversial or difficult to understand.

It is the defensive deployments that have been somewhat controversial, and in particular, I believe the modernization of the air defense component, the nuclear version of the standard missile which is the new air defense missile for the fleet. It is called the SM-2N. Before discussing the SM-2N in a little bit more detail, let me say that the Navy has put together what I regard as an excellent basis, kind of philosophical basis for the nuclear modernization program. They have two criteria that apply. They will not simply replace an old nuclear system because of its obsolescence. They have to show a need and have an analysis that shows that the replacement would be effective, and they will not buy a nuclear capability if there is a conventional capability that will do the same job.

Senator THURMOND. Dr. Wagner, Senator Hart has to leave to go to another committee.

May we interrupt for just a minute?

Senator HART. Thank you, Mr. Chairman.

I have just one factual question. One of your viewgraphs talked about deployments worldwide of tactical and short range nuclear weapons. Where outside NATO do we deploy those weapons?

Dr. WAGNER. [Deleted.]

Senator HART. I understand, but nowhere else?

Dr. WAGNER. I think that is it. [Deleted].

Senator HART. And no plans to put them anywhere else?

Dr. WAGNER. [Deleted.]

Senator HART. Thank you, Mr. Chairman.

Senator THURMOND. You are welcome.

Dr. WAGNER. On the fleet air defense, there is often a criticism leveled at fleet defense that says a ship is a fairly vulnerable thing;

how can we hope to defend it against a nuclear attack by the Soviets. [Deleted.]

[Deleted.]

So we feel that because of that the deployment, the production and [deleted] deployment of the SM-2N will really quite substantially deter the Soviets in starting a nuclear war at sea [deleted].

[Deleted] are other Navy modernizations for antisubmarine warfare systems; [deleted] the reason I am mentioning these today, actually, is because they are in the Department of Energy production planning budget which you will hear about tomorrow. Those two ASW weapons are a submarine-launched ASW system which can reach out considerably further than the current obsolete one, the SUBROC, and has better safety and security features for shipboard storage of nuclear weapons; and then finally, the last system is a replacement, a depth bomb for aircraft delivery to replace the [deleted] bomb which is currently used by the fleet for air delivered ASW.

That concludes my discussion of the theater nuclear weapon posture.

[The prepared statement of Dr. Richard L. Wagner follows:]

PREPARED STATEMENT BY HON. RICHARD L. WAGNER, JR., CHAIRMAN, MILITARY LIAISON COMMITTEE [MLC] TO THE DEPARTMENT OF ENERGY AND ASSISTANT TO THE SECRETARY OF DEFENSE [ATOMIC ENERGY] ON NUCLEAR WEAPONS PROGRAMS

Mr. Chairman and members of the subcommittee, it is my pleasure to appear before you again this year to discuss the Department of Defense's perceptions of this country's non-strategic nuclear weapons program—its importance, the requirements for it, and its adequacy. I have invited one member from each of the military departments to accompany me in order to respond to questions concerning the specific non-strategic nuclear weapons requirements of his service. Throughout my presentation I will likely use the terms tactical, theater, or non-strategic as meaning the same thing.

This year marks the fortieth anniversary of the end of world war II. During the past four decades, there has been no armed conflict between the United States and the Soviet Union, or between NATO and the Warsaw Pact—in contrast to the first 45 years of the twentieth century, in which we witnessed two global conflagrations. These past 40 years also represent the longest continuous period of peace Europe has known since the early nineteenth century. This is no accident. It is, in large measure, a result of the policy of deterrence adopted by the United States and the Western democracies in the wake of World War II, a policy designed to deter any aggression, either conventional or nuclear, against ourselves or our allies.

Even if we ignored the direct and indirect role of nuclear forces in deterring conventional attack, in a world where the knowledge of nuclear weapons cannot be banished, the United States would still have to maintain nuclear forces to deter nuclear attack on its allies and on itself. That does not mean we are under any illusions about the consequences of a nuclear war between the major powers;we believe that neither side could win such a war. This recognition on our part, however, is not sufficient to prevent the outbreak of nuclear war: It is essential that the Soviet leadership understand this as well.

But while we work to preserve deterrence, we must also think about and plan against possible failures of deterrence. If deterrence should fail, we must plan for flexibility in our forces and in our options for response, so that we might terminate the conflict on terms favorable to the forces of freedom, and reestablish deterrence at the lowest possible level of violence, thus avoiding further destruction. The ability to do this, of course, strengthens deterrence in the first place, this concept of seeking both to enhance deterrence, and to limit the level of destruction, by having flexible and enduring forces is not new. It has been squarely in the mainstream of American strategic thinking for over two decades.

Maintaining a stable strategic deterrent requires a variety of retaliatory strategic forces—a triad of land-based ICBM's, manned bombers, and submarine-launched

ballistic missiles. The unique characteristics of the independent and separate components that make up the triad bolster deterrence by acting in concert to complicate Soviet attack planning, making it more difficult for the Soviet Union to plan and execute a successful attack on all these components while at the same time defending against their combined and complementary retaliatory effects. The triad also acts as a hedge against a possible Soviet technological breakthrough that could threaten any single strategic system. In addition to a strong triad, stability of deterrence in a crisis and the effective and responsible use of our nuclear forces depend on a responsive and survivable command, control, and communications system.

While America's strategic nuclear systems are NATO's ultimate deterrent force, we also have nonstrategic nuclear forces in Europe to help deter a Soviet nuclear or major conventional attack on our NATO allies. This deterrence is founded on NATO's ability to retaliate against the Soviet Union and its Warsaw Pact allies in Europe, and on a clear Soviet recognition that the use of nuclear weapons risks engagement of the strategic nuclear systems of the United States.

The nonstrategic (or theater) nuclear weapons program is the focus of my comments today, but I would like to say a brief word about the Department of Energy. You will hear more in our session tomorrow, however, I feel that it is important to note that the Department of Energy, in partnership with the Department of Defense and the Congress has provided this deterrent capability to the United States by developing and producing the nuclear warheads to arm the retaliatory strategic forces as well as the nonstrategic nuclear forces. As the Soviet threat has evolved, so too has our strategy of flexible response, and the DOE has responded to this evolving strategy with new designs and new capabilities to maintain and enhance the flexibility of our responsive posture. They are full partners in establishing and continually improving our capabilities, thus preserving our posture.

In previous testimony, I have discussed what I called earlier "keeping the Soviets in a deterred frame of mind," deterring the Soviets has often been thought of simply as a matter of keeping the Soviet attack exchange calculations unfavorable to them, both in our view and in theirs, thereby avoiding a Soviet attack. [Deleted.] Is involved in deterring them than the arithmetic of exchange calculations—which is, of course, what you would expect.

The Soviets have always been concerned with"image"—their obsession with propaganda and legitimacy shows that. Their images of themselves and of us, in the context of deterrence, are made up of many things—numbers and sizes of weapon systems, their technical characteristics, general technological capabilities of the two societies, national will, and purpose and place in the flow of history. Because of their buildup, they have passed us in the more quantifiable elements of the image comparison—numbers and sizes of weapons. [Deleted.] But, on the other hand, we know that tests between our technologies, such as U.S.-made jets versus Soviet-made jets over the Bekaa Valley in Lebanon, and the technology of our cruise missile developments, are often sobering experiences for them.

I believe these deterring perspectives extend also to the nonstrategic nuclear warhead technologies. [Deleted.]

I am certain that the experience reinforced Soviet respect for our capabilities, a respect that continues to have deterrent effect.

What deterrence comes down to in the end, then, is to keep things so that if a crisis comes that they might want to resolve by force, they will have a gut feeling that they won't measure up against us. It is often said that the Soviet leaders are conservative. They are when they feel inferior, but they often are not when they feel they have an edge: They often have taken advantage when they perceive an opportunity, such as in Cuba or Afghanistan. I believe that our level of technology in itself, quite apart from exactly how it is built into fielded systems, affects their overall image of themselves and of us, and thus can have a significant deterrent effect. DOE technology in the warheads is an integral part of this aspect of deterrence.

With respect to theater nuclear forces, the political realities in NATO and the related need to modernize our conventional forces will mean that modernization of our nuclear forces will not move as rapidly as those of us would like who are familiar with their obsolescence. Instead, our strategy must be to proceed with modernization where we can—principally to continue with the nuclear artillery developments (Albeit at lower total build levels) [deleted.] and to put greater effort into providing increased survivability for the smaller number of older systems that we will have, so that their overall deterrent quality is enhanced. This survivability work will also draw heavily on DOE R&D resources—principally at Sandia—so that in this area of TNF, as well as for strategic systems, there will be a net need for in-

creased DOE RD&T, (I will address the question of survivability, and the closely related issue of weapon security, in a later section of this statement.)

I would now like to report on the status of modernization of the nuclear artillery projectiles. For some years we have been working to replace the obsolete W33 8-inch artillery-fired atomic projectile [AFAP] with the new W79 and the obsolete W48 155MM AFAPS with the W82. The W82 development program was stopped by Congress 18 months ago, but an agreement allowing resumption was worked out last summer. This legislation was introduced by Senator Johnston and supported by Senator Nunn.

The key provisions and conditions established for the 155MM nuclear program are shown here. [Slide deleted.] Restart of the 155MM nuclear program was linked to the 8-inch, W79, that is now in production. With the assistance of DOE, OSD, and the joint staff, the army conducted an analysis of options available under this legislation. The critical need for a modernized 155MM nuclear projectile was reaffirmed and a program recommendation was made to the Secretary of Defense. On 4 February 1985, Secretary Weinberger approved the plan and the next day it was delivered to Congress as required.

This slide [deleted] shows the highlights of the plan and outlines our current AFAP modernization direction. Note that this is a joint DOD and DOE plan. Given the conditions imposed by section 1635 of the law, it was determined that a mix of [deleted] projectiles makes the best use of the previous investment in the W79 program while simultaneously providing a reasonable program for DOE to adequately establish W82 production capability.

A mix of 155MM and 8-inch nuclear projectiles will permit use of the large numbers of 155MM howitzer tubes, thus enhancing survivability and optimizing deterrence.

[Deleted] after General Rogers submits his nuclear requirements this spring, JCS, with service input, will reassess our ability to meet worldwide nuclear artillery requirements.

I would like to briefly review the need for a modernized 155MM nuclear projectile.

[Deleted.]

This slide shows the trend in the balance of delivery systems and warheads in Europe. It also depicts the consequences of no 155MM nuclear capability. Today we are outnumbered in both delivery systems and warheads by the Warsaw Pact. The NATO disadvantage in nonstrategic nuclear forces is projected to continue to grow because of Soviet Warsaw Pact expansion and modernization. If the 155MM nuclear projectile is not replaced, note the overwhelming superiority the Warsaw Pact will have by 1990.

The fiscal year 1986 DOD budget request includes $19.6M for continued RDT&E on the W82. The DOE budget seeks appropriation of $15M, authorized last year, to begin facility construction. This appropriation is critical to fielding the W82 in 1989. An additional request of $10M to complete the DOE facilities will be made in 1987.

Let me now cover the 8-inch AFAP, the W79. The W79 is currently in production. To date approximately [deleted] in accordance with the 1985 DOD authorization act, there will be no further production. The planned production of [deleted] DOD acquisition cost for this projectile is complete. Active U.S. Army and USMC unit certification is also complete. Here again we don't know our total requirements until SACEUR requirements are received. [Deleted.]

I would now like to briefly update you on the status of the Pershing II and GLCM deployments.

The Soviet monopoly in longer range intermediate range [LRINF] systems and their continuing deployment of the SS-20 led to the 1979 NATO ministerial decision to deploy 572 longer-range intermediate range [LRINF] systems while concurrently seeking arms reduction talks with the Soviets. NATO deployments of PII, as shown on this graphic, began in November 1983, with the first battery attaining initial operational capability [IOC] in December of that year. [Deleted.]

PII is an evolutionary modernization of the P1A and offers both increased operational capability and enhanced survivability. PII has a range of 1,800 KMS as compared to the [deleted] and a [deleted] PII's increased responsiveness, coupled with the deletion of the requirement for many pieces of ground support equipment, has resulted in enhanced survivability. These improvements also allow for deployment of PII further behind the NATO/Warsaw Pact border while still providing a hard target attack capability with a lower yield warhead. PII offers a responsive, deep attack capability with low collateral damage.

The subsonic flight, terrain following GLCM is capable of being operated from either fixed base or dispersed site configurations. When located at its fixed base,

GLCM will be housed in hardened shelters to provide protection from conventional attack. During peacetime, a number of missiles will be on QRA status and when directed, the GLCM's will disperse to unimproved covert field positions. [Deleted.]

The ground launched cruise missile [GLCM] is being deployed at six locations in five NATO countries; United Kingdom, Italy, Belgium, the Netherlands and the Federal Republic of Germany. In the UK, RAF Greenham common achieved its IOC in Dec. 1983. [Deleted] Cosimo, Italy achieved its IOC in March 1984. [Deleted] when FOC for all five countries is complete, the UK will have [deleted] missiles; Italy, [deleted] Belgium, [deleted] the FRG, [deleted] and the Netherlands, [deleted].

Over the longer term, development of [deleted] these systems will also need features which contribute to greatly enhanced survivability, including features in the warhead itself. This emphasis is driven by both the Montebello decision to reduce the nuclear weapon stockpile in NATO and the [deleted] the stockpile.

Turning now to the area of fleet theater nuclear warfare (tactical) weapons, the Navy has embarked on a program to revitalize its nuclear warfare capabilities. This program was initiated in 1980 by the Navy and the Secretary of Defense because the deterrent value of existing navy nonstrategic weapons had been eroded significantly by the growing Soviet nuclear threat. An example of this threat to our Navy is evident in the large number of air- and submarine-launched anti-ship cruise missiles in the Soviet nuclear inventory. In the face of this threat, the Navy must meet its global commitments in support of the maritime strategy—the Navy element of national military strategy. The maritime strategy requires that U.S. Naval Forces operate in forward deployed regions, which includes an ever present uncertainty of nuclear attacks on our fleet by Soviet land-based and at-sea forces. The Navy theater nuclear warfare [TNW] modernization program is designed to remove any incentive for the Soviets to use their nuclear weapons at sea. This program requires hardening our ships and aircraft against the effects of nuclear weapons, such as blast, radiation, and electromagnetic pulse. It requires a comprehensive theater nuclear warfare training program.

[Deleted] these improvements combine to deter Soviet use of nuclear warfare at sea by raising the level of uncertainty that such attacks would serve their war aims.

It is not Navy or OSD policy to buy nuclear weapons automatically as replacements for systems being retired. We require a clear case for the utility of each weapon. Nuclear weapons should not serve as substitutes for conventional weapons where improved conventional weapons will suffice. We will procure only those nuclear weapons which provide a unique and substantial military capability. [Deleted.] The point is that the Navy nuclear weapons modernization program is well-defined and integrated with the Navy's conventional capability.

With the exception of the new nuclear Tomahawk Cruise Missile, the Navy has not deployed a new nonstrategic nuclear weapon since 1964. Most of the existing Navy nonstrategic nuclear weapons were designed in the 1950's, deployed in the early sixties. [Deleted.] The Tomahawk Nuclear Land Attack Cruise Missile, or TLAM/N is one of the most significant Navy nuclear weapon developments. Tomahawk is planned for SSN-637 and SSN-688 class attack submarines; DD-963 and DDG-51 class destroyers; CGN-9, 36, 38 and CG-47 class cruisers; and BB-61 class battleships. These ship and submarine classes will be capable of carrying all Tomahawk variants in any desired mix. TLAM/N will greatly enhance the Navy's deterrence posture by distributing Navy retaliatory striking power across a large number of naval platforms. This will increase the number of Warsaw Pact targets that are put at risk [deleted] Tomahawk complements the power of the carrier air wing and multiplies the effectiveness of the force at sea. TLAM/N will also contribute to the NCA's ability to deter strategic conflict and will provide additional survivable assets [deleted] TLAM/N reached initial operational capability [IOC] in June, 1984. At present [deleted] ships and submarines are certified to carry TLAM/N, within the next 5 years, [Deleted]. TLAM/N missiles will be deployed in [deleted] ships and submarines.

A nuclear version of the standard surface to air missile, SM-2(N) is currently being developed to meet the very real Navy requirement for a nuclear self-defense missile. [Deleted.]

The SM-2(N) is a weapon for deterrence and has a unique, well-defined role [deleted] it deters Soviet use of nuclear weapons at sea by increasing the probably that such an attack on the U.S. fleet would fail, The SM-2(N) is needed [deleted].

Another key warfare area is antisubmarine warfare [ASW]. Soviet submarine improvements include double hull designs, titanium hull construction, deeper operating capabilities, and torpedo countermeasures, [deleted]. In order to deal with these faster, quieter, and more survivable Soviet submarines, new ASW weapons are required. An improved conventional torpedo looks promising; however, to prevent the

possibility that improvements in Soviet systems could negate, at some point, the capabilities of our conventional ASW weapons, we must have nuclear ASW weapons. The ASW stand-off weapon [ASW SOW], a nuclear-capable submarine-launched rocket, is required to replace subroc, a system [deleted].

Just as the Army has a valid requirement for the W79 and W82 warheads to modernize battlefield nuclear artillery, the Marine Corps also deploys with 8-inch and 155MM artillery and must replace its equivalent aging, obsolete stockpile of W33 and W48 warheads. [Deleted] Artillery-fired atomic projectiles are earmarked for deployment with the Marine Corps. I ask that this subcommittee recognize this important Marine requirement when evaluating the DOE budget for production of W79 and W82.

The last Navy tactical program to be discussed is the BS1 nuclear gravity bomb. Although the new B61 mod 3 and mod 4 bombs, which contain improved safety and security features, are allocated to the Air Force to modernize their [deleted] bomb stockpile, the Navy will benefit indirectly from this program . [Deleted.]

Through initiatives in nuclear survivability for the ships and aircraft, nuclear weapons modernization and training, the Navy is providing forces with the potency to deter war at sea. The Navy's nuclear warhead requirements are individually important to Navy missions, collectively support national security and deserve your continue support.

With respect to the security and survivability of our stockpile, the numbers, characteristics, and basing locations of nuclear weapons have changed considerably since their initial introduction into Europe in 1953. When first deployed to Europe, nuclear weapons were stored and secured in a manner not unlike that of conventional munitions. Although they were more heavily guarded, the facilities themselves at most nuclear weapon storage sites varied only slightly from existing conventional munitions storage sites. New sites were constructed based largely upon criteria developed for conventional munitions. At that time, a security threat to nuclear weapons even remotely like today's terrorist threat was perceived to be quite small—if it was recognized at all. Although measures were taken to protect nuclear weapons from unauthorized actions, the basic configuration of the storage facilities dating from those years is still being used to store nuclear warheads. [Deleted.]

During the late sixties and early seventies, increasingly violent threats and acts of terrorism in some countries brought a vivid awareness of the magnitude of terrorist capabilities, and a realization of the extremely serious consequences of such actions should they be directed against nuclear weapons. The NATO nations responded by initiating a variety of short-term measures such as improved security defense plans, improved local liaison, better guard force armament, erection of barriers and construction of defensive positions. (At the same time, a U.S. physical security research and development program was started to examine ways to protect nuclear weapons from this new threat—protection methods which would, for the first time, be commensurate with the weapons' intrinsic value and latent hazard. However, the products of this research would not be available until the early eighties.)

In 1976, with U.S. prefinacing support, NATO initiated the Long-Rang Security Program [LRSP]. This program provided hardened guard facilities and towers, improved lighting, onsite communications, fences, auxiliary power supplies, and electronic intrusion detection sensors [IDS] for both storage facilities and around the perimeter of the sites.

Currently within NATO there are [deleted] locations scheduled to receive LRSP civil works upgrade [deleted] of those are complete and over [deleted] more are projected for completion in [deleted] all sites are projected to have civil works completed by the end of [deleted].

[Deleted] there are currently [deleted] in NATO scheduled to receive IDS in stallation. [Deleted] sites, prefinanced by the U.S., are completed, on 16 November 1984, NATO awarded a contract for the remaining sites and a prototype site is being constructed now in Italy. Completion of IDS installation is projected for [deleted].

In 1980, we conducted force-on-force adversary tests [deleted] development of access delay equipment was undertaken in response to these tests; this equipment is now being installated on storage structures which contain [deleted] the weapons access delay system [WADS] consists mainly of equipment placed [deleted].

It is important to note that the security improvements made by the LRSP civil works and IDS progrrams and WADS are largely extensions of security measures developed to protect non-nuclear weapons and facilities whose intrinsic value is far less than and qualitatively different from nuclear weapons. So far, these improvements do not address the fundamental problem that [deleted]. In fact, as we have first moved warheads from dispersed kasernes into consolidated storage sites and then began to close sites in the interest of saving dollars and manpower. [Deleted.]

The Air Force is planning to field a weapons storage vault which, when implemented, will be an encouraging step in the direction of reversing this trend toward decreased survivability. The Air Force plans to install vaults at [deleted]. Installation of these vaults will significantly increase the security and survivability of the Air Force weapons, improve operational security and safety, and improve aircraft upload times.

This storage vault is but one example of a diverse array of technology now becoming available to do the weapons storage and transport job right, in a way well suited to nuclear weapons, both for survivability and for peacetime security, with the possibility of implementation during the mid-90's to take us into the next century. Through the NATO senior level weapons protection group, which I chair, we are laying the groundwork for a long term, comprehensive reconfiguration of our storage and transport posture which will materially improve both the peacetime security and the survivability of the NATO nuclear stockpile. In fiscial year 1986, DNA will begin to demonstrate the feasibility of placing Army weapons in vaults similar to that developed for the Air Force. They will also demonstrate a low cost and extremely simple system which promises to reduce weapon loading time by more than 50 percent. Also, DNA is developing a secure and survivable weapons container. This system will incorporate access delay and ballistic protection features. The concept will provide a means to expedite weapon dispersal from storage sites, more secure and survivable transport of weapons and storage in field locations, and provide the potential to reduce the unique signature of weapons movements associated with the presence of large security forces.

Since 1972, we have been trying, with success which may be only temporary due to the evolving threat, to compensate for a nuclear weapon storage facilities design that dates back decades. With programs implemented during the past decade, that is, the long range security programs [LRSP] to improve fences, lights, etcetera; the intrusion detection system [IDS] program; more recently the weapon access delay system [WADS] program and the improvements in site defense tactics and ground force training, we have a set of piecemeal improvements good enough for today, and we have to complete them as rapidly as possible. However, [deleted] therefore, it is essential that we not stand still and focus only on completion of LRSP, IDS, and WADS. We must push forward to develop a comprehensive program for major improvements in storing and transporting nuclear weapons overseas. This comprehensiveness is important for several reasons: First is the objective need for improved security and survivability; second, it is important that such a widespread change not occur piecemeal, as was the case with the current set of security upgrades; third, a comprehensive approach will allow us to look for synergisms or inconsistancies so we can get the most for our money and so we can more easily assess how much is enough.

As my final point, I would like to briefly comment on production and stockpile.

The nuclear weapons stockpile exists only to support deterrence, and it is difficult to quantify deterrence—some combination of force levels, threat, perceptions, intentions, capability. Because of this, there is no "formula" for arriving at levels for the number of weapons. Fundamentally, it will always remain a subjective, long-term judgment.

Our requirements for nuclear weapons, which are prepared jointly with the Department of Energy and forwarded annually in the nuclear weapons stockpile memorandum to the President for his approval, are based upon inputs from the CINC'S and tied closely to approved programs for nuclear weapons delivery systems. These systems are typically high visibility procurements which receive high-level attention both within the administration and the Congress. The force levels finally arrived at reflect a compromise between the contending factors of the threat, required target coverage, support of deployed forces, survivability, support of allies, procurement cost, and life cycle cost. For nuclear-only systems, the cost of the nuclear warhead is typically only a small fraction of the total system cost.

For some dual capable systems, such as artillery and tactical bombs, the situation is somewhat different and the nuclear weapon procurement is not closely tied to the weapon delivery system procurement. Nonetheless, in arriving at numerical requirements, similar compromises are made between the contending factors described above. However, in the case of these dual capable systems, it is difficult to ascribe a cost to the nuclear portion of the dual capable delivery system. As a consequence, some are tempted to argue that these nuclear weapons are regarded by the services as "free" and not subject to the same degree of detailed justification as the dedicated nuclear systems. This is not true—any nuclear weapons system involves a significant degree of cost, both dollar and manpower, to the using service and the decision to obtain or maintain that capability is taken with careful deliberation. But beyond

that, the bulk of these dual-capable systems have, for several years, received careful scrutiny in the NATO political context to be certain that we have the minimum essential number. This was underway long before the Montebello decision, and when Saceur makes his report next month, it will lead the way to further reductions. With the numbers receiving such careful attention, the remaining issue is one of the need for modernization, the stockpile for these dual-capable systems is unquestionably obsolete.

That concludes my formal testimony. I, as well as the representatives of the military departments, would be happy to answer questions.

Senator THURMOND. Thank you very much.

The distinguished chairman of the full committee, Senator Goldwater, is here this morning and I am wondering if he has any statement or questions.

Senator GOLDWATER. I just have a couple of questions, Mr. Chairman, and I thank you.

RETALIATION

This is an old, old question to me, Mr. Perle, and I don't know if there is any new answer to it, but let's say May Day comes and the Russians decide to open hostilities; anybody would conclude that their first targets would be our tactical airbases in Europe.

Now, they have two methods of attack in my opinion that would make it impossible for us to retaliate. One would be the use of chemical warfare against which we have no defense. I doubt that they would choose that weapon, as that first choice. The second is the one that bothers me, and that is suppose they decide to attack all of our tactical bases with tactical nuclear rockets or nuclear weapons from aircraft. How long is it going to take our forces to get permission to retaliate in kind?

Can it be done immediately, or does it have to come, again, as it did 20 years ago, with a request to the President of the United States to use these weapons? Has that changed?

Mr. PERLE. [Deleted.] The release decision involving the President of the United States, and in case of NATO, our NATO allies meeting in Brussels, [deleted].

It is for this reason that we believe it is vital to the execution of NATO strategy that the weapons be dispersed well in advance of a Soviet attack, [deleted].

We recognize that and believe, therefore, that timely dispersal is essential. Once the weapons are dispersed, they present not a handful of targets but many hundreds of targets, and the Soviet capacity to destroy all of those would be very doubtful indeed.

Now the question arises how do you get a timely dispersal [deleted]. This is a problem that we have taken directly to NATO. I chair a committee of the alliance that modestly calls itself the High Level Group. It was created in 1977. And the current task of that committee is to examine ways in which we can make those critical retaliatory nuclear forces more survivable, and we have identified within that group this problem of an early dispersal [deleted].

Now, separate and apart from the question of early dispersal is the question of ordering a retaliatory attack, the release of the weapons for use against Soviet or Warsaw Pact targets, [deleted].

Senator GOLDWATER. Well, the problem remains exactly the same as it was when this problem first came up. The Soviets could render our air forces completely useless in a matter of an hour or

two by the use of these tactical nukes on the runways. They wouldn't have to worry about the aircraft.

If we can't retaliate, we are looking at, in my opinion, a 2 or 2½ day war with them winning. I wish there was some way we could develop a retaliatory strategy that could enable us to attempt to render their airfields and aircraft inoperable. But I don't see that, and I don't think you see it either.

Mr. PERLE. Well, I believe it is important not to view the defense of our airfields, as we have tended to view it in the past, as simply a matter for air defense systems, but rather, to reach out and attack the fields from which Soviet aircraft would be launched, counter air operations. There is great interest in that in the Department of Defense. We are presently looking at ways to render Soviet airfields inoperable for long enough to blunt the kind of attack you have in mind without resort in the first instance to nuclear weapons.

I think about the only hope we have with respect to the scenario you have described is that the Soviets would not wish at the opening of a conflict to commit to the use of nuclear weapons because they would fear the escalatory nature of that act and the almost certain eventual retaliation against the Soviet homeland.

So in a war that began with a conventional phase, we ought to be equipped to attack Soviet and Warsaw Pact airfields with conventional weapons more effectively than we can do that today.

Senator GOLDWATER. I keep getting back to the first purpose of going to war is to win it, something we have forgotten all about, and if you can't make up your mind—and the Soviets are no different that we are. If they want to win that war in 1 day, which any good commander wants to, I think they are going to use anything they have. I am talking of the small aircraft nukes. But I don't want to spend all my time on that. I know that you don't have the answer, it is not your fault, but somebody someplace has got to start making up their minds because I don't think we are going to see, if we ever have a struggle over there, the Soviets confining themselves to conventional attacks on what I call our superior air force even though it is outnumbered.

AGING NUCLEAR PROJECTILES

Now, I want to get over to the nuclear projectile. Does age hinder the nuclear warhead?

Dr. WAGNER. It does in two ways. One is that we know today how to build better capability into the warheads than we knew 10 or 20 or 30 years ago, and the Soviets are certainly building those capabilities into their warheads. And so an old warhead is at a disadvantage just in a technical sense from the point of view of its less capable characteristics.

But warheads do age. They are made of chemically reactive materials, plutonium, uranium high explosives, and lithium. So over a course of many years, measured in decades, not a few years, one expects the warheads themselves to degrade. We have seen some instances of that in the stockpile and have been able to catch them early enough to retrofit systems before the degradation had proceeded too far. But that is a real danger of the kind of almost year

for year aging that we have seen, especially in the tactical stockpile.

Senator GOLDWATER. I have a purpose in asking that question because I know that you can give good reasons for aging. We are looking at two different types of weapons in your chart. One is the air-to-ground, the air-launched cruise missile which has a propellant charge attached to it. Therefore, it in itself is susceptible to attack that would result in exploding the whole thing, not necessarily detonating the nuclear end, but it would make the weapon inoperative.

However, unless the nuclear warhead for ground purposes has the propellant charge attached to it, which I am not sure it has, then you would be protecting them, in my opinion, in these vaults, from theft rather than from destruction. If the projectile is attached to the warhead, then you have an explosive problem.

Now, do they come as a unit?

Dr. WAGNER. In most cases there is [deleted].

Senator GOLDWATER. I see.

Dr. WAGNER. But I should say that even in the vault, especially in the vault, [deleted].

That is really the direction we have to go.

Senator GOLDWATER. I have no further questions, Mr. Chairman, and I will have to leave. I will try to get back in a little while.

Thank you.

Senator THURMOND. Thank you.

I have one question here for you, Dr. Wagner, and for you, Mr. Perle.

ANTITACTICAL BALLISTIC MISSILE SYSTEM

Should we undertake to develop an antitactical ballistic missile system to address the very serious threat to critical NATO targets posed by Soviet short and intermediate range ballistic missiles equipped with nuclear, chemical or conventional warheads?

Mr. PERLE. I believe we should, Senator Thurmond. [Deleted.] It is an area that we are entirely free to pursue under the terms of the ABM Treaty, and I think it is one that we should be devoting considerable energy to.

Dr. WAGNER. And I believe, sir, that it is technically feasible to develop a quite capable ATBM system, and in fact, has been for some years.

PERSHING II

Senator THURMOND. Dr. Wagner, would you explain the changes in the Pershing II program that enable you to buy out this program in fiscal year 1986?

Dr. WAGNER. I am sorry, sir, I missed the question.

Senator THURMOND. Would you explain the changes in the Pershing II program that enable you to buy out this program in fiscal year 1986?

Dr. WAGNER. [Deleted.]

SAFETY, HANDLING, SECURITY PROBLEMS

Senator THURMOND. Dr. Wagner, would you comment on any safety, handling, or security problems that exist in our existing stockpile of tactical nuclear weapons?

You need not make your answers long, just come to the point as quick as you can because we have got a lot of other questions and another panel to hear from.

Dr. WAGNER. Yes, sir.

[Deleted] and that in fact is one of the main reasons for needing to modernize the stockpile, is to build the new safety and security features into the weapons that we feel are required.

Senator THURMOND. Dr. Wagner, can you tell us anything about the progress and content of General Rogers' study on NATO tactical nuclear force requirements?

Dr. WAGNER. No, sir, I cannot. He has handled the development of that study in a very confidential way because it is quite sensitive with the allies, and he has wanted to make it a true alliance product. But we will see what it says in a couple weeks.

Senator THURMOND. Thank you.

Mr. Perle, I have a few questions for you.

NATO'S DECISION TO WITHDRAW TACTICAL NUCLEAR WEAPONS

Mr. Perle, is the NATO decision to unilaterally withdraw tactical nuclear weapons from Europe tied to the modernization of our remaining stockpile?

Mr. PERLE. Senator Thurmond, that decision was based on a report prepared by the NATO Committee that I am priviledged to chair, and throughout the deliberations that preceded the report and in the report itself there are references to the need, if we are going to reduce the number, as we are, to modernize the remaining force, to improve, I think is the term that we used. [Deleted.] But I think there is a general recognition within the alliance that it is essential to improve the smaller residual force that will result from these reductions.

Senator THURMOND. Mr. Perle, does NATO fully support all aspects of our tactical and theater nuclear force modernizations?

Mr. PERLE. I think it is fair to say that the governments whose representatives participate in these deliberations have supported the plans, all of the plans that we presently have under way. There is, as you know, opposition in a number of countries, but the governments have been generally supporting our efforts.

Senator THURMOND. Mr. Perle, would you provide us with an update on the status of the deployment of ground-launched cruise missiles in Holland and Belgium?

You can provide that for the record, if you would.

Mr. PERLE. Yes, I will be glad to do that.

[The information follows:]

DEPLOYMENT OF GROUND-LAUNCHED CRUISE MISSILES

The first 16 GLCM were deployed to Belgium on 15 March 1985. In addition, the Belgian Government announced that, in the absence of an arms control agreement, the remaining 32 GLCM planned for deployment to Belgium will be deployed no later than mid-1988. Preparations for this follow-on deployment are underway.

In the Netherlands, the Government has announced that a final deployment decision will be taken on 1 November 1985 and that Parliament will be asked to approve this decision in January 1986. [Deleted.]

TACTICAL NUCLEAR FORCES IN EUROPE

Senator THURMOND. Mr. Perle, what would be the impact of our failure to modernize our tactical nuclear forces and our chemical deterrent on our ability to conduct a successful conventional defense of Western Europe?

Mr. PERLE. Senator, as I indicated earlier, I think the tactical nuclear forces play an important, indeed, a vital role in causing the Soviets to disperse and thereby enabling us to mount a more effective conventional defense. So I think there is a close and important relationship.

With respect to chemical weapons—and I believe when this session is concluded you will turn to the subject of chemical weapons, I think we—just on the chemical weapons point, because I won't be here for that part of your discussion, I think we have our heads in the sand on chemical weapons, Senator Thurmond. The Soviets attribute great importance to the offensive use of chemical weapons. They have a massive establishment for that purpose. They train assiduously in the delivery of offensive chemical weapons. We have not modernized our stockpile for the last 15 years, and the Congress has not permitted us to proceed with the binary program.

I think it is vital that we get on with that program or we may find ourselves in a situation where we have no credible retaliatory capability with chemical weapons, and the Soviets will feel free to use them in wartime.

There is a Presidential commission that I testified before yesterday now examining this. I am eager to see the results of their deliberations, and I very much hope the Congress this year will move forward on the binary program. We are rapidly reaching the point where we will not have any chemical capability.

EDUCATING THE PUBLIC ON CHEMICAL WEAPONRY

Senator THURMOND. I thoroughly agree with you.

I am wondering what we can do to convince the public more of the need for this. After all, public opinion will control. They are beginning to look on chemical weaponry like nuclear weapons, and they think if we do away with them, then nobody will use them. But the public doesn't seem to realize that the enemy has those weapons and will use those weapons. Therefore, we ought to have them as a deterrent.

Mr. PERLE. I agree entirely. I don't think there is——

Senator THURMOND. Are you all doing enough to—what I am driving at is the executive branch of the Government doing enough to inform the public on these matters?

Mr. PERLE. We are trying to do so. During the period in which we were attempting to carry out the NATO decision to deploy Pershing II and ground-launched cruise missiles, [deleted].

That deployment is now largely behind us, and I think we should devote a good deal more public discussion to chemical weapons than before. There isn't a doubt in my mind that Hitler would have

used chemical weapons on a massive scale were it not for the capacity of the allies to respond with chemical weapons, and if we are left without a chemical deterrent, I think we have to expect that chemicals will be used against us.

Senator THURMOND. I am wondering if the Secretary of Defense and the secretaries of the services shouldn't hold press conferences and have experts there with them to tell the public the true situation.

What is the use to keep this hush-hush? The enemy knows what they have got, and they know we have very little. What is the objection to coming out in the open and letting the people know, because then public opinion will crystallize and the Congress will act? But until public opinion does crystallize, the Congress may not act.

Mr. PERLE. I think that is right, and I very much hope that this Presidential commission which is due to report in a matter of weeks will become the focal point for the kind of national debate on this subject that is long overdue.

Senator THURMOND. Mr. Perle, we have received testimony that [deleted].

In a scenario where chemical weapons are used extensively, what amount of degradation do we plan for our short-range nuclear systems, and how would this impact upon the need to resort to early use of theater nuclear weapons?

Mr. PERLE. If I may, Senator Thurmond, I would like to give you a more quantitative answer for the record.

Senator THURMOND. That is all right. Answer it for the record if you wish.

Mr. PERLE. Fine.

[The information follows:]

EFFECT OF CHEMICAL ATTACKS

The effect of chemical attacks upon all our theater nuclear systems (to include nuclear capable artillery units) prior to initiation of nuclear warfare falls into three categories: casualties due to direct chemical attack, casualties and equipment loss occurring because of degradation due to protective measures, and loss of efficiency in combat operations due to protective measures.

The casualty rate from chemical attacks is dependent upon the protective status at the time of attack. Assuming that we are prepared for a chemical attack by wearing protective clothing but not a protective mask, and that our forces are well trained to don their mask in the prescribed time, then we believe the chemical attacks could result in about 10 percent casualties.

Degradation from protective measures required after an attack is estimated to be about fifty percent. This degradation results from individuals having to wear protective clothing, including masks and gloves due to the presence of agent, particularly in fire control centers and while having to handle ammunition. All artillery and missile units are particularly degraded in their ability to displace and reestablish firing sites while contaminated. It is the latter factor that increases significantly the vulnerability of nuclear capable units prior to initiation of nuclear warfare. The increased vulnerability would result in more rapid loss of the nuclear capable units, similar to the more rapid loss of aircraft due to chemical degradation. We expect nuclear systems to be more heavily targeted by a chemical attack, as in conventional or nuclear attack, since it is a matter of overall Soviet doctrine that potential nuclear delivery means are their highest priority target.

Since many of our nuclear systems also fire conventional munitions a major impact of efficiency loss due to chemical attack is upon their ability to perform even their conventional fire support role. This loss in fire power is also a significant factor in breaking down our ability to conduct a conventional defense, the prime reason for considering resort to nuclear weapons.

In summary, chemical attacks on our nuclear capable units prior to initiation of nuclear warfare increase the attrition rate of those units and significantly decrease the conventional fire support available. Thus a chemical attack forces us to more rapidly face the prospect of requiring their nuclear capability, since the need for nuclear support is more likely to arise earlier. The only way to avoid this dilemma is to have a chemical warfare deterrent consisting of both credible chemical retaliatory capability and chemical protection measures.

Senator THURMOND. Dr. Wagner, I have one more question for you.

Dr. Wagner, you mentioned in your testimony the security test conducted against our nuclear weapons storage facilities.

Did you also test for vulnerability during the transport phase when weapons leave the storage site and are en route to the delivery systems?

Dr. WAGNER. [Deleted.]

Senator THURMOND. We are going to take a 10-minute break before we go to the next panel.

We will take a recess.

[Questions with answers supplied follow:]

QUESTION SUBMITTED BY SENATOR STROM THURMOND

PERSHING II

Senator THURMOND. Can you provide for the record any preliminary findings on the Pershing II accident in West Germany?

Answer. Accident investigation report results were provided to the Chairman of the SASC, HASC, SAC, and HAC on 24 April. Executive summary and press release were presented.

QUESTIONS SUBMITTED BY SENATOR JEREMIAH DENTON

W82 PRODUCTION

Senator DENTON. Although the W82 is being built without ER capability at the direction of Congress, would it be possible to add that ER capability at some future time? What do you estimate the production time and cost to be? Are we maintaining the engineering and manufacturing capability to build the ER capability if necessary?

Answer. As directed by Congress, the W82 will be produced in a non-enhanced radiation version. [Deleted.]

QUESTIONS SUBMITTED BY SENATOR JOHN GLENN

MONTEBELLO DECISION AND SACEUR STUDY

Senator GLENN. In October, 1983, the NATO ministers in the so-called "Montebello Decision" directed a reduction in the number of nuclear warheads in Europe over the next several years. They directed General Rogers, SACEUR, to conduct a study and provide recommendations on the mix and composition of forces. The SACEUR study was to have been completed by now.

First, has the study been completed?

Second, what are the results of the study in terms of recommended composition and mix of theater nuclear forces?

Third, what is the timing presumed in the study? When would the recommendations if supported by the NATO Ministers, be implemented?

Answer. The study has been completed, and General Rogers briefed the results to NATO Defense Ministers at the NATO Nuclear Planning Group meeting in Luxembourg on 26 March 1985.

As requested by Ministers at Montebello, the study identified the nuclear warheads which could be withdrawn from the NATO stockpile in order to reach an end-1988 level of [deleted] weapons. The composition and mix of the resulting stockpile would be: [deleted.] The recommended reductions assume that a limited number of

[deleted] would be deployed, and that ongoing deployment programs (F16 and Tornado Aircraft, B61 bombs, and Pershing II and GLCM) would continue.

Some of the measures recommended by SACEUR (e.g., replacement of Nike Hercules by conventional Patriot) are already ongoing, and will be continued. Other measures, if supported by NATO ministers, would require bilateral consultations between the United States and those NATO Allies which deploy nuclear forces and receive US nuclear support. [Deleted.]

THE WEAPONS ACCESS DELAY SYSTEM (WADS)

Senator GLENN. Several years back we had a serious problem with security of nuclear weapons at storage sites in Europe. They were potentially vulnerable to terrorist action. A program to correct that problem has been developed, called the Weapons Access Delay System. Please describe the Weapons Access Delay System and give us a progress report on how many of our installations have been fitted with it?

Answer. The Weapons Access Delay System (WADS) is a menu of components which, when installed in and on storage structures, will delay unauthorized entry into and removal of weapons from those structures. The components are [deleted]. The delay is achieved by the synergistic effect created by these obstacles that must be overcome [deleted]. The WADS components are being installed on a site-by-site basis. Installation at three sites [deleted] is complete. WADS components will be installed at [deleted]. Installation at [deleted] is complete. Construction is ongoing at [deleted] with construction scheduled to begin at [deleted]. The site in the [deleted]is also scheduled to begin construction in [dele leted]. Contract award in [deleted] is expected in [deleted] respectively.

Senator GLENN. When will the WADS system be completely installed in nuclear storage sites in Europe?

Answer. Construction in [deleted] is complete. Construction in [deleted] is scheduled for completion in [deleted]. Construction in [deleted] is expected to be complete by [deleted].

SECURITY OF NUCLEAR STORAGE SITES IN EUROPE

Senator GLENN. How would you characterize the risk we face today to terrorist action.

Answer. Security forces at nuclear weapon storage sites are designed to intercept and neutralize a dedicated force of [deleted] people, who are well trained in sophisticated guerilla tactics and techniques, well equipped and armed, and with either ground or air transportation (i.e., helicopter), prior to any member(s) of that force obtaining access to or damaging nuclear weapons. To date, there has been no terrorist action against any nuclear weapon storage site.

Senator GLENN. The Air Force is examining a weapons storage system that would place nuclear bombs for delivery by aircraft in vaults that would be built into the floor of hardened aircraft shelters. The vaults would not be manned and are constructed in such a way to deny access to the bombs until security teams can reach the shelters. Has the Air Force decided to proceed full scale with this vault system of storage?

Answer. Yes. The vault (Weapons Storage and Security System, (WS^3) is in full scale development.

Senator GLENN. If you have decided to proceed full scale with this system, when will it begin and when will it be completed?

Answer. Production will begin in late [deleted] with installations in Europe starting [deleted]. Completion is scheduled for [deleted].

Senator GLENN. What are the arms control implications of placing nuclear storage facilities within aircraft shelters as opposed to within nuclear storage compounds? Since an aircraft could be covertly loaded at any time with nuclear weapons, would this be considered more threatening? Is it worth the risk compared to the security problems of convoys and the signal that would send to the Soviets in times of crisis?

Answer. The politico-military implications of several measures designed to improve NATO's nuclear warhead storage and transport posture are currently being examined by the NATO High Level Group. These measures include [deleted]. The benefits which would be gained by implementing this measure in terms of safety, security, and survivability would significantly enhance the credibility and effectiveness of NATO's deterrent; the arms control impact would appear to be minor in view of the fact that those aircraft on quick reaction alert (QRA) are already uploaded with nuclear weapons. It should be noted that the [deleted].

Senator GLENN. To what extent would the vault system constrain future design of air delivered nuclear weapons? How much flexibility will you incorporate in the design of the vaults to permit larger/longer nuclear weapons in the future?

Answer. The vault has been designed to accommodate planned and anticipated nuclear weapon storage requirements. The Air Force is reviewing its design length in relation to future, unvalidated, theater weapons requirements. [Deleted.]

NUCLEAR SEA LAUNCHED CRUISE MISSILES

Senator GLENN. As you know, the Navy is installing nuclear capable Tomahawk sea launched cruise missiles on combatants today.

Are these weapons under the operational control of SACEUR? Who has responsibility for authorizing their use? What role does SACEUR have in assigning them targets and coordinating their strikes?

When do nuclear Tomahawks come under the operational control of SACEUR in times of crisis? What is the chain of communications by which SACEUR communicates his strike orders to the fleet?

ANSWER. Nuclear Land Attack Tomahawk (TLAM/N) capable ships are general purpose platforms and may be deployed in the SACEUR Area of Responsibility (ACR) in carrying out their primary missions. In the event a TLAM/N capable ship is assigned to NATO, operational control of the ship will be exercised through established NATO procedures. TLAM/N [deleted] and is subject to release procedures common to all U.S. nuclear weapons. Any decisions relative to TLAM/N use remains with the President.

There is no change in operational control of TLAM/N missiles from peacetime to wartime. The U.S. President retains authority to release TLAM/N.

An example chain by which SACEUR, after appropriate coordination with USEUCOM, communicates his strike order to the fleet includes [deleted].

Mr. PERLE. Thank you, Mr. Chairman.

Senator THURMOND. Thank you, gentlemen, very much.

[Whereupon, at 10:37 a.m., the subcommittee recessed, to reconvene at 10:45 a.m. for the consideration of other matters.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1986

WEDNESDAY, MARCH 13, 1985

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

BINARY CHEMICAL MODERNIZATION PROGRAM

The subcommittee met in executive session, pursuant to notice, at 11:12 a.m., in room SR-222, Russell Senate Office Building, Senator Strom Thurmond presiding.

Present: Senator Thurmond.

Staff present: Alan L. Chvotkin, counsel; Douglas R. Graham, John J. Hamre, George K. Johnson, Jr., professional staff members, and Karen A. Love, staff assistant.

Also present: Henry D. Sokolski, assistant to Senator Quayle; and Jeffrey B. Subko, assistant to Senator Exon.

OPENING STATEMENT BY SENATOR STROM THURMOND

Senator THURMOND. The committee will come to order.

Our second panel will focus on the programmatic aspects of the Binary Chemical Modernization Program. Our witness, Dr. Tom Welch, is the Deputy Assistant to the Secretary of Defense for Atomic Energy and Chemical Matters.

Dr. Welch participated in a very good hearing before the full committee on February 28 which focused on the military requirement for the Binary Chemical Modernization Program. In my view, the modernization of our chemical deterrent with binary munitions is one of this Nation's highest national security priorities.

Dr. Welch, we are glad to have you with us. You may proceed.

STATEMENT OF DR. THOMAS J. WELCH, DEPUTY ASSISTANT TO THE SECRETARY OF DEFENSE FOR ATOMIC ENERGY AND CHEMICAL MATTERS, ACCOMPANIED BY CAPT. RICHARD A. MARSDEN, USN; LT. COMDR. SCOTT JOHNSON, USN; MAJ. WILLIAM MILLER, USA; AND COL. GEORGE CONNOR, USA

Dr. WELCH. Thank you, Mr. Chairman.

I thank you for the opportunity to again appear before you.

As you requested, we will present this morning some more details of the fiscal year 1986 request. We will especially emphasize the adequacy of the stockpile destruction of that part of the stock-

pile that is no longer useful to us. I will also ask the Navy project manager for the Bigeye binary bomb to join me and present an update on the status of the Bigeye chemical bomb.

Our entire budget request is driven by our national policy which is summarized on the first viewgraph.

U.S. CW POLICY REMAINS UNCHANGED

- ELIMINATE THREAT BY ARMS CONTROL
- UNTIL AN EFFECTIVE BAN IS ACHIEVED, POSSESS CHEMICAL WEAPONS FOR DETERENCE
- NO FIRST USE OF CHEMICAL WEAPONS
  - CONSIDER USE
    - ONLY IN RESPONSE TO USE AGAINST U.S. OR ALLIES
    - ONLY IN A PROPORTIONATE MANNER INTENDED TO DISCOURAGE FURTHER USE

It remains our national policy to do everything we can to eliminate the threat of chemical warfare by arms control. In the meantime, however, we find it necessary to maintain the deterrent capability that would cause others who would even think about using chemical agents against the servicemen and women of the United States or of our allies, cause them not even to think it through. This requires that we have a defensive capability as well as a retaliatory, no-first-use capability.

Now, as we talk about this policy and try to maintain it in this country, we also have to keep an eye on the battlefield realities. Among them are countries that continue to use chemical agents.

[Slide deleted.]

[Deleted.]

[Slide deleted.]

They cause horrible casualties. [Deleted.] It is because of these uses that we see——

Senator THURMOND. Is that biological or chemical?

Dr. WELCH. That is chemical, mustard gas.

Senator THURMOND. That is mustard gas?

Dr. WELCH. Yes, sir, it was developed in World War I. It is maintained by the Iraqis, by the Soviet Union. It is used by other nations.

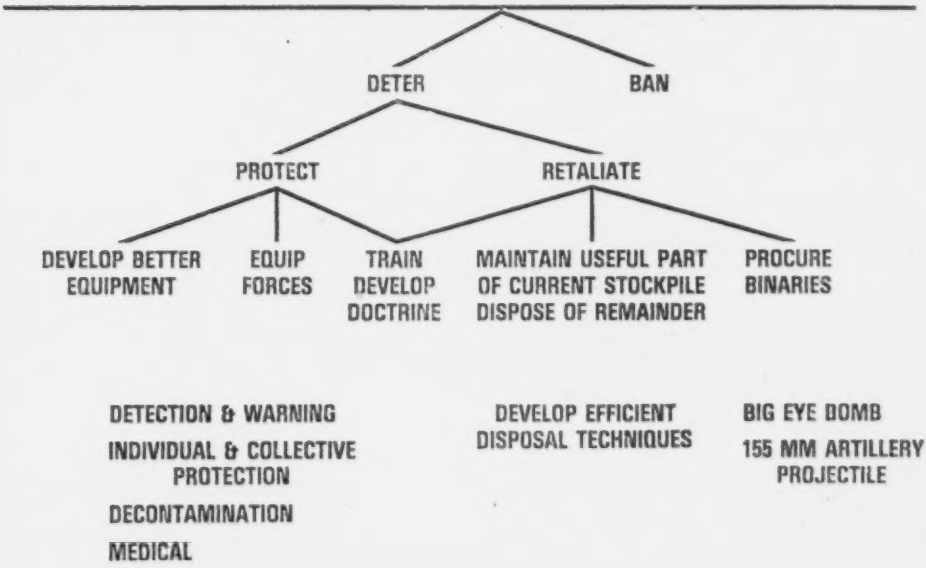
[Slide deleted.]

It is called also a blister agent, and this rather gruesome [deleted].

Senator THURMOND. Does that have to be inhaled, or is it lethal if it strikes the body anywhere?

Dr. WELCH. It works both ways. Inhalation is the primary problem with these kinds of casualties that you see here, and in addition to the blister on the outside, you must in your mind's eye also see that kind of damage to the respiratory tract for unprotected soldiers. This tells us, of course, that we must never permit our servicemen and women to go into battlefield without at least some protection because they would be such an inviting target that these countries with chemical agents, whether they are Warsaw Pact, Soviet Union or Third World, might just be tempted to use them.

ELIMINATE THREAT OF CHEMICAL WARFARE



Therefore, we have developed a policy which says that at the same time we try to achieve arms control, not only with the Soviet Union now, but also with the other [deleted] nations that we know have chemical agents, we must maintain a protective program and a retaliatory program.

Senator THURMOND. If we are going into this business, which I hope we will—I think we made a great mistake all these years not to have done it before—what type of chemical would be best for us to develop or would we develop a number of different types of chemicals? In other words, would you advise mustard gas or some other kind of chemical?

What is your recommendation?

Dr. WELCH. My recommendation is what the field commanders tell us they need, and that is a persistent nerve gas and a nonpersistent nerve gas.

Senator THURMOND. A persistent nerve gas and what else?

Dr. WELCH. Yes, sir, and a nonpersistent nerve gas. What General Donnelly, General Otis, and others in the field are telling us is

they would like an artillery round that contains a nonpersistent nerve gas, and that is what we are proposing in this budget.

This means that when they move very quickly back and forth around the main battle area, which is their contingency plan for fighting a war, there is a lot of movement around the main battle area. They will be able to put a nonpersistent agent on the enemy and then a few hours afterwards occupy that terrain without any danger of contaminating or hurting themselves; the agent would disappear within a few minutes to a few hours, depending upon the weather conditions.

They are also asking for a deep strike capability, and that is the rationale to support our asking for the Bigeye bomb. The Bigeye bomb would contain a persistent, or a long lasting nerve agent. This means if the Soviets were to use agents against us, and if the President told us to retaliate, we would look to something like the Bigeye bomb to contaminate and keep contaminating a Soviet airfield. The persistence of that agent means that it would last anywhere from 3 days to perhaps 3 weeks. It means that our airmen would not have to go back and recontaminate that airfield every day.

Senator THURMOND. How would you clear an airfield once it is contaminated?

Dr. WELCH. It is a very difficult task if the agent is persistent, and the Soviets would have their hands full to clean up after a Bigeye attack.

Senator THURMOND. Does that kind of chemical agent land on the surface and contaminate it in that way?

Dr. WELCH. Yes, sir.

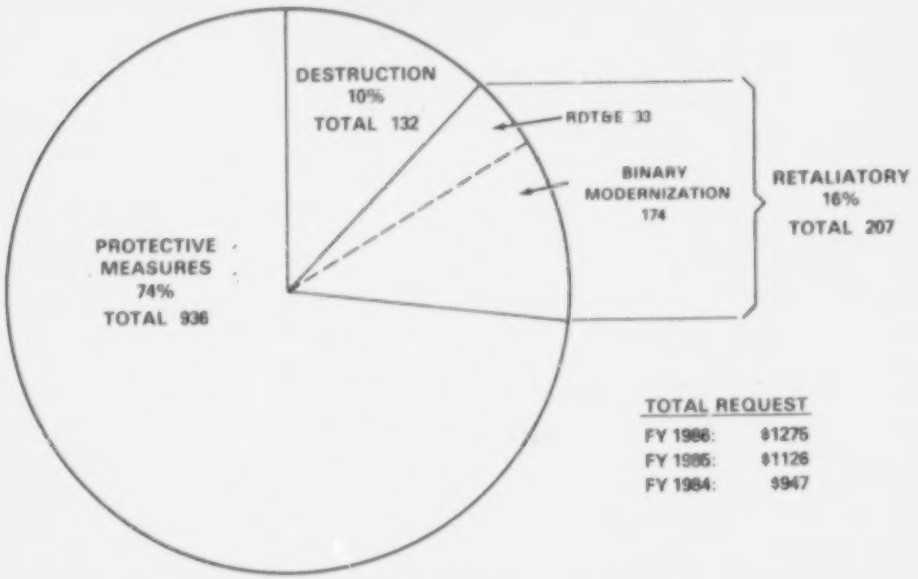
Senator THURMOND. Is it in the atmosphere? Just how does it take effect?

Dr. WELCH. In your mind's eye you should see a toxic rain coming down from this Bigeye bomb that we intend to produce. If you looked on the ground after an attack, you would see every 2 inches or so a drop much like a raindrop, perhaps one-sixteenth of an inch across. It would be thick. It would have the consistency of a heavy oil, like a motor oil. If you step into it, it sticks to your clothing and will penetrate your clothing. It gets carried into hangars, it gets carried into other places by your feet, by your shoes, and as I said, it will last typically 3 days to 3 weeks, depending mostly on temperature and wind.

In very cold temperatures it can last for longer periods.

This prevents an enemy from operating at full speed. It means the Soviets would be required to get into their protective costumes, their masks and their overgarments. Their masks would be required even though there is a very low vapor pressure. Not too much by way of gas would come out of these drops, but there would be sufficient gas coming off to pose an inhalation hazard. So it requires them to either take casualties or to get into a protective posture that will reduce his sortie rate to less than one half of what it would normally be.

FY 1986
CHEMICAL WARFARE DETERRENCE
PROGRAM ($M)



This slide shows a breakout, Senator, of our budget request. You can see that nearly three-quarters of it is for defense. Ten percent of it is for destruction of parts of our stockpile, those parts that have reached the point where they are so dangerous either by leaking or for some other reason that we should destroy them promptly. Also, some dollars are in there to do the research and development that will help us find less expensive ways of destroying the entire stockpile.

There are dollars in there also to support arms control negotiations. We are demonstrating to our allies as well as our foes that it is possible to destroy chemical munitions safely and in a way that would satisfy arms control agreements.

Sixteen percent is for a retaliatory stockpile. Here is where we are asking for the Bigeye bomb and the 155-millimeter artillery projectile.

I think it is important that we get into the record the kinds of things we need for defense, and I am not going to explain each of these bullets to you.

Senator THURMOND. You can put that into the record if you wish.

Dr. WELCH. All right, sir.

[The information follows:]

Protective RDT&E Fiscal Year 1986

	Millions
Chemical defense, Army (lead service, advanced technology, emphasis upon detectors, operational troop test, dugway modernization)	$180
Medical defense, Army (antidotes, pretreatments, vaccines, patient decontamination, treatment and support systems)	162

	Millions
Chemical defense Navy/USMC (improved ship detection system, flight/hanger deck protective equipment, test helicopter mask, Marine Corps operational tests)	21
Chemical defense, Air Force (improve flight protection, improve collective protection)	29

Defensive procurement (including O&M and war reserve)

	Millions
Army (light weight decontamination system, new protective mask, simplified collective protective system, protective clothing: training, war reserve, host nation support civilians; operational test and support)	$302
Navy Marine Corps (protective clothing: Marine Corps, ship board Navy, helicopter crew, overseas base personnel; USMC decontamination systems)	87.5
Air Force (protective clothing, survivable collective protection systems, automated detectors)	126

Defensive Milcon

	Millions
Army (chemical school buildings, dugway modernization, instructional facilities)	$22.5
Air Force (collective protection)	6.5

Dr. WELCH. In order to avoid duplication and unnecessary expenses, we have designated the Army to be the lead service in research and development. This means that the Navy, the Air Force and the Marines Corps look to the Army to do those research and development things that would eventually yield a common mask or a common detector and so on.

As we said on the 28th of February, defense is not enough. It is necessary that we also have a retaliatory capability.

LETHAL CHEMICAL AGENT STORAGE SITES

We have stored in the United States and in Johnston Island in the Pacific, as well as in West Germany, chemical munitions and chemical agents. Unfortunately, all of these agents are in the lethal state. These projectiles are filled with lethal agents which if they leak out of the projectile or if we have to ship these across the United States to a port or to an airport, pose special safety and handling problems. We would like to rid ourselves of these lethal agents and produce what the field says it needs.

Destroying these is going to present a very expensive and challenging task to us given the Environmental Protection Agency rules, given Health and Human Services rules, and given the size of the old stockpile. It is going to be an expensive proposition.

The objectives of our destruction program are shown here.

OVERALL OBJECTIVES

Provides disposal capability in support of national policy objective on chemical disarmament.

Destroys obsolete and unserviceable munitions that have no deterrent value.

Directs assigned disposal tasks in a safe, technically sound and cost effective manner.

Develops technology for less costly techniques with positive safety and pollution control.

Provides for the essential disposal of the entire unitary stockpile.

We have a carefully thought out, disciplined way of proceeding with destruction, sometimes called demilitarization. The drill and transfer system has proved itself to be a very useful way of safely destroying leakers, problems of chemical munitions that we find from time to time in our stockpile. The chemical agent munition disposal system is showing us the road ahead. It is a pilot plant or a demonstrator project that permits us to try out new research and development schemes of destroying agents safely yet less expensively.

We talked on the 28th of February about the fact that we have about 500,000, half a million M-55 chemical rockets for which we have no launchers. This is a very obsolete weapon system designed for a different war in a different time. They are beginning to leak. They are well past their shelf life and pose a special challenge to us.

MAJOR CHEMICAL DEMILITARIZATION PROGRAMS

PROGRAM	FY85	FY86	FY87
• DRILL AND TRANSFER SYSTEM	2.1	1.0	1.0
• CHEMICAL AGENT MUNITIONS DISPOSAL SYSTEM (CAMDS)	17.1	38.6	20.1
• BZ DISPOSAL	19.3	26.9	14.7
• JOHNSTON ATOLL CHEMICAL AGENT DISPOSAL SYSTEM (JACADS)	77.5	33.0	20.3
• M55 DISPOSAL PROGRAM	16.3	7.3	104.6
• RESEARCH AND DEVELOPMENT	8.4	13.8	9.8
• TECHNICAL SUPPORT, STUDIES, OVERHEAD	9.8	11.6	10.9
TOTALS	150.5	132.1	181.4

We consider chemical demilitarization or destruction as a national problem. It is not the kind of thing that we look to a service alone to solve. We see no difficulty from a national security standpoint to destory all of those agents and all of those munitions if at the same time we produce the needed, separated component or binary munitions.

CONCLUSION

Chemical demilitarization is national problem.

Demil program is essential to support of national policy objective on chemical disarmament.

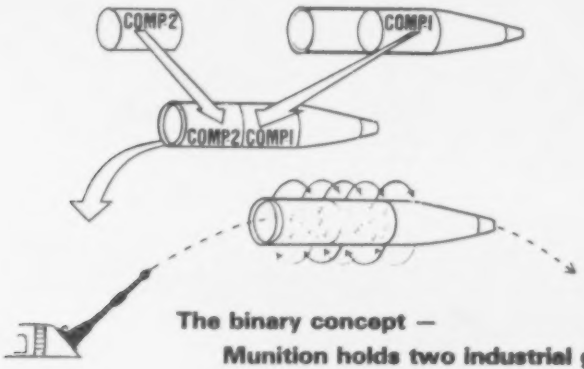
Army has proven that chemical munitons can be destroyed in a safe, environmentally sound and cost effective manner.

Chemical demil will continue to be a controversial and expensive program.

Plans for disposal of entire unitary stockpile will be developed to support the chemical modernization program and any chemical disarmament treaty.

Let me now talk about the retaliatory part of this program that we are requesting, in particular, the separated component or binary modernization program.

SEPARATED COMPONENT MUNITIONS



The binary concept —

Munition holds two industrial grade, non-lethal chemicals

Lethal agent forms by mixing after the munition is fired

We feel very strongly that we need and must have a credible deterrent, and this means a credible chemical retaliatory stockpile. We are talking some very serious matters here, it seems to me, and Richard Perle earlier this morning touched on them.

Aggressors invited to attack with chemicals.
Conventional force improvement negated.
Nuclear threshold lowered.
Chemical protection degrades combat effectiveness 50 percent.
Chemical arms control efforts doomed to failure.

We are very concerned about preserving and promoting our national policy of keeping the nuclear threshold as high as possible because chemical agents are so devastating, even against protected troops who, while they might be able to survive, certainly cannot operate very effectively.

We are afraid this threshold will be lowered without a retaliatory capability to deter first use to begin with.

U.S. OPERATIONAL REQUIREMENTS FOR CHEMICAL WEAPONS

- PLACE ENEMY AT RISK
  - SHORT, MIDRANGE, DEEP
  - PERSISTENT AND NON-PERSISTENT AGENTS
- DEGRADE AND SLOW THE ENEMY
  - DELAY, DISRUPT, DISORGANIZE
- SAFETY
  - DEPOT
  - MOVEMENT IN U.S.
  - FORWARD DEPLOY
    - SHIPS
    - LAND BATTLE AREAS

When we asked General Otis, General Donnelly, General Rogers and the others what is it that they need, they tell us that they need nerve agents, as we discussed earlier. But they need them for these operational reasons. They know that even if they cause not one Soviet casualty, they can put the enemy at risk. They know they have no capability to do that today except in a very limited sense around the main battle area.

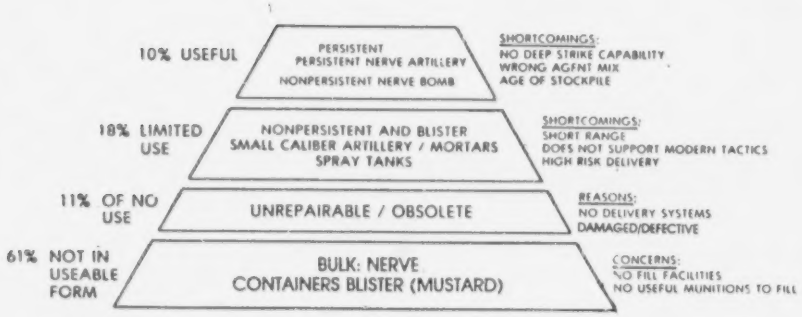
The asymmetry, they pointed out in their testimony, rested on the fact that the Soviet Union can put chemical agents on NATO throughout the battle area, from the main battle area all the way back to our ports, depots, and so on. They also touched on safety, realizing that we could not easily forward deploy today's lethal chemical munitions as found in the stockpile.

This will be difficult for you to read at that distance, but certainly in the record we want to show the limitations in greater detail of what we call today's stockpile.

Senator THURMOND. It is much too small to read. Put it in the record and make your statement.

[The information follows:]

RETALIATORY CAPABILITY
(current stockpile)



—UNITARY—

Dr. WELCH. I suppose the most important finding of mine in the 5 months that I have held this position is that if I look very closely at what the field commanders are saying they need and what the current stockpile provides to satisfy those needs, I come to the conclusion that 97 percent of what is in that stockpile is not useful.

I then have to make the judgment that we no longer have a credible deterrent, and that of course is not supportive of the national policy.

Now, you can spend some time arguing about what is adequate and what is suitable, what is a shortcoming, what is a deficiency, but it is my judgment that 97 percent of the stockpile simply does not satisfy what I hear the field commanders saying they need. That is not surprising given the fact that we have done nothing to modernize the stockpile in over 15 years.

[Slide deleted.]

Here is a summary of what the field commanders through the Joint Chiefs tell us they need. In the stockpile for artillery, there are some rounds that we can use. However, we need to build separated component or binary artillery rounds of this number in order to satisy their needs. We have no need for nonpersistent bombs.

As I mentioned to you, the field commanders are telling us that if they have an aerial bomb to be used by the Air Force and the Navy, they want a persistent agent that will stay there and not cause them to have to go back day after day.

Now, if you look at these numbers and compare them to the numbers we have in the stockpile today, we are really asking for a new stockpile that is on the order of [deleted] percent of what today's stockpile contains. That is a classified number, as you just saw, but we are going to decrease [deleted] if our program is approved.

Senator THURMOND. In other words, I understand that our stockpile is so depleted now that our modernization program is equivalent to building a new and smaller system altogether?

Dr. WELCH. Yes, sir. There is no question about that.

Senator THURMOND. Do you have any particular location in mind? I think Arkansas was mentioned, as I recall.

Dr. WELCH. Yes, sir. We do have Pine Bluff, AR, in mind, and we also have other depots in mind.

Now, there has been some concern with some of your colleagues about the deployment of binary munitions. It came up this morning with Mr. Perle and Dr. Wagner. We have not asked any European country to take on binary munitions. Indeed, it is going to be 1987 or 1988 before we see our first binary munitions come off the line.

But more to the point of forward deployment, binary munitions give us the capability to do something we have never been able to do before with lethal munitions. Because they are not lethal, because they come in two parts, each part separate from the other, and each part nonlethal, or low toxicity, we can forward deploy chemical munitions on ships, and indeed, with a worldwide threat, it is no longer a chemical threat just in Europe, it is a worldwide chemical threat, we can look to the Navy to carry on their carriers and on their pre-positioned ships binary munitions.

In the same way that conventional munitions are forward deployed on the high seas, either in a supply ship of this type or an aircraft carrier or something else.

These ships carry industrial chemicals that are more troublesome than what we find in these carefully secured binary munitions. So we don't really believe there is a severe requirement to ask a country to permit us to put binary munitions into their country.

BINARY MEANS SAFETY

Never again need a U.S. depot contain lethal chemical agents.

Lethal agent will only be produced after: 1. Enemy use; 2. President directs retaliation; 3. separate components moved to battle; 4. separate components fired toward enemy and mix.

Domestically, there has been support for binary because it means that never again will depots have to contain lethal munitions. We talked about the tragedy in Bhopal, India, about the fact that that industrial gas is nowhere near the lethality of nerve agents. This means that we can produce binary and destroy the stockpile as it sits right now, and it means that never again will we have to have lethal agents in a domestic stockpile.

It also means with our policy that we would never use these binaries until someone used these chemical agents against us or our allies.

A President directs we retaliate, the components are moved forward to the battle area separately, safely, and only after the projectile or the bomb is launched over the head of the enemy, only then are these two agents, these two components, allowed to mix and make nerve agent.

Here is a summary of the binary modernization funding request. We are ready to start production for the 155mm. We are ready to start building a facility to make one of the components of the Bigeye bomb known as QL.

Fiscal year 1986 funding profile—Binary Modernization Program

	Millions
Army:	
155mm RD production	$21.7
Bigeye bomb:	
QL facility	48.0
Fill/lap facility [MCA]	10.8
Fill/lap equipment	28.3
Metal parts facility	17.6
Facility prove-out costs	4.4
Army total	130.8
Navy:	
Bigeye bomb production	21.5
Air Force:	
Bigeye production	22.1
DOD total	174.4

Senator THURMOND. You can put that chart in the record. In fact, you can put all these charts in the record.

Dr. WELCH. Yes, sir.

CONCLUSION

Soviets have an overwhelming advantage.
Proliferation has occurred.
No U.S. militarily effective retaliatory capability.
U.S. servicemen and women are at risk.
Modernization with a smaller, safer, more effective stockpile redresses the imbalance.

Our conclusion at the end of all of this remains, as we said before, that the Soviets have an overwhelming advantage. In addition, it is more likely in my mind that we are going to see, if we see any chemical use in the Third World, in a non-Warsaw Pact kind of scenario, proliferation has occurred, more countries than ever before have agents, and we have to be prepared for those kinds of contingencies.

There is no question, as Richard Perle said and people from the field have said, service men and women are at risk until we get ourselves a credible retaliatory stockpile, modernized, no first use, safe, that will remain that way.

Let me ask Captain Marsden to sit over here now, sir, and answer some of the questions you had about the Bigeye Program. I will be very pleased to answer any questions you may have now, or if you prefer, I will wait until the end.

Senator THURMOND. Dr. Welch, you can answer, or the gentlemen with you.

In a recent study of the independent National Academy of Sciences entitled "Disposal of Chemical Munitions and Agents," they assert that about 90 percent of the inventory of chemical agents and nearly as much of the munitions inventory, has little or no military value and will require disposal, regardless of future decisions regarding the binary weapons program.

Would you agree with this assertion, and would you comment on it?

Dr. WELCH. I agree completely. I agree with these distinguished and independent people with no affiliation to DOD, that it does not take a military expert to realize that those chemical munitions are

of no use, they are junk, they ought to be destroyed, especially the ones that are now dangerous.

Senator THURMOND. Captain, did you want to make your presentation, and then we will have a few more questions.

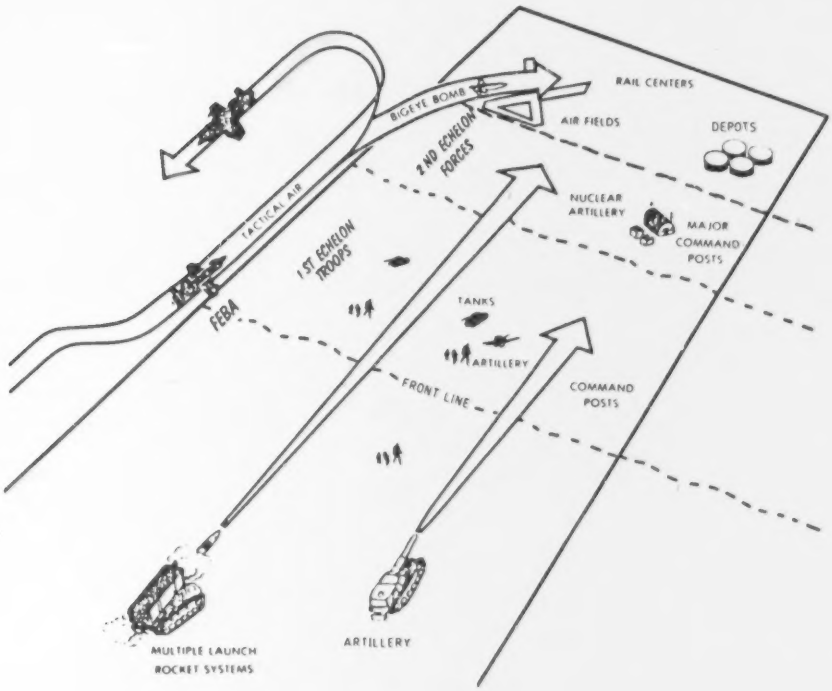
And please move right along.

BIGEYE BINARY CHEMICAL WEAPON

Captain MARSDEN. Good morning, Mr. Chairman. I am Captain Dick Marsden, the program manager for the Joint Air Force-Navy development program for the Bigeye binary chemical weapon. My principal message this morning is to tell you that the Bigeye has been tested, although not operationally, but it is planned to be tested operationally beginning next month, and that it works.

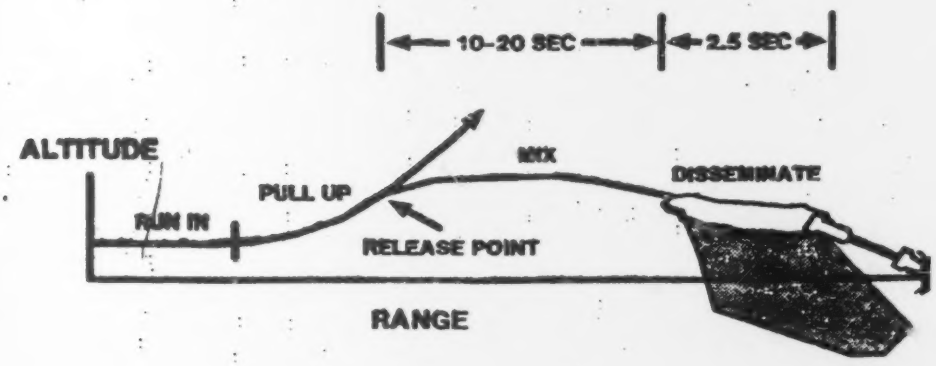
The Bigeye binary concept is illustrated in this viewgraph, which I know is difficult to see from there, but the two principal components of it are the bomb body which is on top and the ballonnette containing a powdered sulfur. The ballonnette is inserted into the weapon when it is to be loaded on an aircraft, either an Air Force aircraft at an air base or a Navy aircraft on an aircraft carrier. The two components are stored separately in magazines and air stations, or in different compartments in a ship so they will never come together until we intend to use the weapon.

CHEMICAL EMPLOYMENT CONCEPT



This chart is intended to illustrate that the Bigeye is a deep strike weapon as opposed to the Army Multiple Launcher Rocket System which is a medium range strike, or the 155 millimeter shell. We can carry the Bigeye into deep areas in enemy territory and deliver it with an aircraft.

BIGEYE LOFT DELIVERY



I apologize. I think these are a little difficult to see. The tactics for delivery of the Bigeye weapon are principally a low altitude run in with a tactical aircraft to a target area, a loft delivery of anywhere from one to six or more weapons as desired for area coverage, and then a pull up during the loft for that, and an immediate turn away from the target so as to hazard the aircraft for a minimum period of time in the target area.

As Dr. Welch described, the agent that is released by the weapon is in droplet form, and that disseminates on the ground in a pattern [deleted] dependent on wind conditions. Those factors will be used to judge how many weapons we would use in a target area.

[Slide deleted.]

This chart shows three Bigeye weapons being released in a loft from an A-6 aircraft during the recent safe separation testing program.

[Slide deleted.]

This one, using a colored dye, illustrates what the dissemination looks like from the weapon as it flies through the air and before it hits the ground. All of the agent will be disseminated before the weapon hits the ground.

BIGEYE TESTING

o TECHNICAL EVALUATION

SAFE SEPARATION FROM AIRCRAFT

NAVY 27 SUCCESSESS/28 TRIALS

.USAF 7 SUCCESSES/7 TRIALS

MIXING IN CHAMBER (ACTIVE CHEMICALS)

8 SUCCESS/8 TRIALS

CATAPULT/ARRESTED LANDINGS

2 WEAPONS, 20 TRIALS, ALL SUCCESSFUL

DISSEMINATION OF CHEMICAL SIMULANTS

8 SUCCESSES/8 TRIALS

MIXING OF CHEMICAL SIMULANTS IN FLIGHT

4 SUCCESSES/4 FLIGHTS

ENVIRONMENTAL

VIBRATION, SHOCK, TEMPERATURE EXTREMES, RANDON VIBRATION. TESTING IN PROGRESS WITH 10 SETS OF TEST ARTICLES. MARCH 1985 COMPLETION

o OPERATIONAL EVALUATION

SCHEDULED BY NAVY AND AIR FORCE INDEPENDENT TEST AGENCIES APRIL-SEP 1985. NAVY 20 MISSIONS, 22 TEST ARTICLES, AIR FORCE 14 MISSIONS 20 TEST ARTICLES LOFT, LEVEL, DIVE DELIVERIES.

There is a great deal of information here I know, but my purpose in showing you this is to indicate that we are currently completing our development test program. We will be entering our operational test program in both the Air Force and the Navy in late April. The purpose of our operational testing is to achieve a readiness for production decision which will be implemented, assuming congressional action to fund the program.

This final chart also illustrates the testing that we have done on the Bigeye in our technical evaluation program. All of this testing is complete. We are in the process of completing our final reports.

There is one nonsuccessful test shown there in the upper left hand corner, in a safe separation test from the A-6 aircraft. In that test, the one that was unsuccessful, the fins on the weapon, one of the fins did not deploy. It was not a problem in the flight of the weapon—it flew normally—but we note that is one failure that we had during the technical evaluation program. The A-6 aircraft, based on these tests, was cleared to carry and release 17 weapons.

Are there any questions on anything that I have said or on this chart?

Senator THURMOND. Captain, would you describe for us in some detail the anomaly discovered in the Bigeye Program 2 years ago? What was done since that time to correct it, and the current status of this problem and the Bigeye Program in general?

Captain MARSDEN. Yes, sir.

[Slide deleted.]

I will use this chart to illustrate what I believe the problem was that you are referring to.

Two years ago the concept of employment of Bigeye was to carry it on an aircraft to the target area, and before the weapon was released, mixing of the two chemicals was initiated. After the initiation of mixing, the weapon was to be released.

There was a concern that was raised about 2 years ago that the heat and pressure generated in the chemical mixing, that that heat and pressure generated would be sufficient to rupture the weapon at some point and cause contamination of the aircraft, or to cause early release of chemical agent, or that a problem would be posed when an aircraft had to return to an airfield or a ship would be returning with a toxic agent.

The correction to that problem was to redesign the weapon so that the mixing occurs only after the weapon is released from the aircraft. The time of flight, maximum time of flight of the weapon is 30 seconds. We have demonstrated in our testing program during technical evaluation that within 30 seconds we don't reach any pressures or temperatures, particularly pressures, that would create any structural problems with the Bigeye weapon.

So we believe that we have corrected that problem that showed up 2 years ago.

Senator THURMOND. Now, Dr. Welch, would you provide us with an update on the activities of the Chemical Warfare Review Commission established by the Congress?

PRESIDENT'S CHEMICAL WARFARE REVIEW COMMISSION

Dr. WELCH. The President's Chemical Warfare Review Commission met yesterday for the first time. It is chaired by Ambassador Walter Stoessel, and at the request of the President, other members have agreed to serve, and they are former Congressman Barber Conable, former Gen. Richard Cavazos, former Secretary of State Alexander Haig, the former assistant to the President for National Security, Zbigniew Brzezinski, president of Continental Air Lines Phillip Bakes, former Government civil servant, now a prac-

ticing attorney in Washington, John Kester, former Congressman John Erlenborn.

Senator THURMOND. Let me say this. Any portions of the report that you think ought to go into the record will be admitted. Just highlight it briefly.

Dr. WELCH. Yes, sir. They met yesterday for the first time, and they have a responsibility to return to the President a report that says we have taken a look at the Nation's chemical warfare policy, the retaliatory capability, and chemical modernization is needed or it is not needed. If it is needed, we have taken a look at the stockpile, we have found it to be adequate or inadequate. If inadequate, then we have moved on and made a decision, Mr. President, that says we should go ahead with binary production or we should not.

Senator THURMOND. Dr. Welch, why have we chosen the binary system for modernization of our chemical stockpiles?

Dr. WELCH. Clearly it is the best alternative.

Senator THURMOND. Is that because it is the safest?

Dr. WELCH. It is the safest. It gives us essentially the same effectiveness as pure agent. We can foreward deploy binary. When it is time to destroy it, we can do it much less expensively than we can with pure agent. We also know that it would cost us far more to produce additional pure agent or lethal agent kinds of munitions. It is sensible from all points of view. I don't think there is any difficulty with anyone on that.

Senator THURMOND. I want to ask you this. What kind of alcohol is used in this binary way? I understood it was alcohol and sulfur crystals.

What kind of alcohol is it?

Dr. WELCH. The alcohol is in the 155mm artillery shell. The Bigeye bomb contains sulfur, that is one of the components.

Senator THURMOND. Is that pure alcohol? Is it distilled? Is it rubbing alcohol? Or just in common language that a layman could understand, what kind of alcohol is used?

Dr. WELCH. It is a common alcohol. It is isopropyl alcohol. It also contains isopropylamine which is a smaller part of what goes into the munition. Both of these are commercial industrial chemicals that are used extensively.

Senator THURMOND. Is that the same as rubbing alcohol that people buy in stores?

Dr. WELCH. I am told it is, isopropyl.

Senator THURMOND. Now, what kind of sulfur crystals are used? What is that made out of? Where does that come from?

Dr. WELCH. It is pure sulfur. Of course, for the Bigeye bomb, it is commercial sulfur that is used in a lot of other commercial activities. Of course, it is found in chemistry sets that children use, it is found in high school laboratories, it is entirely safe.

Senator THURMOND. In other words, it is commonly used in chemical laboratories?

Dr. WELCH. Yes, sir.

Senator THURMOND. Neither is considered lethal, but when combined, the ingredient become lethal, is that correct?

Dr. WELCH. That is correct.

Senator THURMOND. Dr. Welch, although you are not involved in the arms control process, could you comment on whether the Soviets have responded positively to the U.S. proposal to ban chemical weapons?

Dr. WELCH. In my judgment, there has been no positive Soviet response whatsoever.

You know, Senator, we are meeting bilaterally and have met bilaterally with the Soviets in Geneva. We have met in the Conference on Disarmament together with the Soviets and other nations. There has been no movement since Vice President Bush put that draft treaty on the table to indicate that we are anxious to make progress. Indeed, if you recall the testimony of Mr. Emery from the Arms Control and Disarmament Agency on the 28th of February, if we expect progress to be made, then we should modernize our stockpile and the Soviets understand that. They understand power and they understand determination.

Senator THURMOND. Does our intelligence show just what type or kind of chemical weapons they have?

Dr. WELCH. [Deleted.] We know they have traditional known agents, the mustards, the nerve agents, some blood agents.

Senator THURMOND. Well, in some briefing we had it was brought out, I believe last week, that they probably have one chemical for which there is no antidote, in other words, if it touches you, it is lethal.

Is that true?

Dr. WELCH. It is certainly true in the case of their agent known as GD. We have very, very limited medical therapy for GD casualty. That is their agent of choice. That is what is going to come down on our men and women at airfields, depots, and other places.

In addition, the Soviet Union has also shown us new agents. They have used them in Afghanistan, probably for research and development purposes. But they have used them on people. Until we know what that is, we cannot say anything about medical treatment. Indeed, if you look at all the Soviet agents, we really possess no antidote in the true meaning of that word. We have some lifesaving antidotes, but if an American becomes a casualty and we provide the very best medical antidote technology available to them, he will not get up and go back into that war. He needs constant care after that point. We merely save his life, and then he needs constant care, not just medical treatment but constant care.

Senator THURMOND. I think that is all the questions that I have.

Is there anything else you want to add?

Dr. WELCH. No, sir; thank you again for the opportunity.

Senator THURMOND. Captain Marsden, is there anything further you want to add for the record?

Captain MARSDEN. No, sir; thank you.

Senator THURMOND. Thank you both, gentlemen, for your appearance here today. I feel again that steps must be taken to get more information to the public on this subject. We need to act, and we ought to act this year. But you have to crystallize public opinion in favor.

We stand adjourned.

[Whereupon, at 11:52 a.m., the subcommittee recessed, subject to the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1986

FRIDAY, MARCH 15, 1985

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

STRATEGIC DEFENSE INITIATIVE

The subcommittee met in open session, pursuant to notice, at 9:09 a.m., in room SR-222, Russell Senate Office Building, Senator John W. Warner (chairman) presiding.

Present: Senators Warner, Thurmond, Hart, Exon, and Glenn.

Staff present: Robert F. Bott, Douglas R. Graham, John J. Hamre, George K. Johnson, Jr., professional staff members, and Karen A. Love, staff assistant.

Also present: Henry D. Sokolski, assistant to Senator Quayle; Mark J. Albrecht, assistant to Senator Wilson; Allan Cameron, assistant to Senator Denton; Janne E. Nolan, assistant to Senator Hart; Jeffrey B. Subko, assistant to Senator Exon; and Phillip P. Upschulte, assistant to Senator Glenn.

OPENING STATEMENT BY SENATOR JOHN W. WARNER, CHAIRMAN

Senator WARNER. The subcommittee convenes in open session this morning to continue to receive testimony on the President's Strategic Defense Initiative in review of the fiscal year 1986 Department of Defense authorization request.

The subcommittee has already conducted two hearings on this important program, and we have heard from both administration officials and public witnesses. We have scheduled two more hearings next week to provide additional opportunities for the subcommittee to be exposed to a range of views on this very important subject.

It is on the basis of this extensive testimony that this subcommittee and eventually the full committee and the Senate will make the decision with respect to this historic new initiative.

Our witness this morning is Lt. Gen. James Abrahamson, U.S. Air Force, the Director of the Strategic Defense Initiative Organization.

On behalf of the subcommittee, I would like to welcome you once again.

On February 21, the Under Secretary of Defense for Policy, Dr. Fred Ikle, and General Abrahamson, provided the subcommittee with the broad policy perspectives in which to view this program. This morning, General Abrahamson will provide us with a more detailed review of the SDI technology program.

Due to the classified nature of some of the material that we will be covering, it will be necessary for the subcommittee to go into executive session after an initial round of questions.

Senator Glenn, do you have any opening statement?

Senator GLENN. No, thank you, Mr. Chairman. I have no prepared statement.

I am glad to welcome General Abrahamson. He is a man well qualified to speak on this. He did an excellent job on the shuttle program when he was running that for NASA.

This is an area I want to follow closely, personally having some technical background in this area. Last summer I spent 10 days touring the country talking to our finest laser scientists and particle beam projector people and microwave projector people, and so on.

I got a pretty good handle on what our capabilities are and where we plan to go. I plan to follow this closely. I look forward to working with you on this.

I favor very strongly the research and still do. My only concern, as you and I have discussed before, is whether when the President kicked this thing off, he was being oversold as to how soon we might be able to put this whole thing into place. I think we have to invent the physics. We are really inventing a new kind of gunpowder.

That is the research going on right now. I support it fully. I am concerned that we don't lead people into any complacency that we will have this ready to go in the immediate future because we have to invent it first. That is what it is all about.

I support your efforts.

Thank you, Mr. Chairman.

Senator WARNER. Thank you, Senator Glenn.

Of course, we also welcome Dr. Stansberry.

All right, General.

STATEMENTS OF LT. GEN. JAMES A. ABRAHAMSON, U.S. AIR FORCE, DIRECTOR, STRATEGIC DEFENSE INITIATIVE; DR. KENT STANSBERRY, DIRECTOR, STRATEGIC DEFENSE AND SPACE ARMS CONTROL POLICY, OFFICE OF THE SECRETARY OF DEFENSE; AND JOHN SELLERS, DEFENSE INTELLIGENCE AGENCY

General ABRAHAMSON. Thank you, Mr. Chairman.

I will offer to the subcommittee a brief written statement. I will not read the entire written statement. I would like to comment and highlight two or three aspects.

I believe at times there has been an impression sometimes in the press that we have varied from the initial program and that is, of course, a misunderstanding. So, I would like to point out that since the President's speech in 1983, we have seen many interpretations of what his vision entailed and what the SDI was expected to accomplish.

In spite of what would appear to be many conflicting reports, I would like to emphasize that our goal has not changed and has, in fact, remained consistent with the direction outlined by the President. The driving force behind his concept is freeing the world from the fear of nuclear conflict.

An ultimate goal is the elimination of all nuclear weapons. To move toward this objective, then, the SDI has been structured as a program of vigorous research focused on advanced defensive technologies with the aim of finding ways to provide a better basis for deterring aggression, strengthening stability, and increasing the security of the United States and our allies.

I would again stress that the SDI is a research program geared to provide a future President and Congress the technical knowledge required to support a decision on whether to develop and later deploy advanced defensive systems.

Such a development would enhance and strenghthen deterrence while also providing critical leverage for truly meaningful reductions in nuclear weapons.

Further, as a research program, the SDI is not a weapons development program, nor is it a program with preconceived notions of what a potential defensive system against ballistic missiles should entail. By that I mean which of the various weapon options we are pursuing could in the end be the most effective. It is too early to indicate that at this point.

Emphasis in the program is being given to nonnuclear weapons for defense. The defense that might evolve from the SDI will not be intended to defend only our strategic weapons systems nor is it a program that should lead to an arms competition in space.

We are considering ways to defend both ourselves and our allies against the ballistic missile threat. As the work moves ahead, we are in full consultation with our allies. It is a research program designed to answer a number of scientific and engineering questions that must be addressed before the promise of new technologies can be fully assessed.

Finally, all the research in SDI will be carried out in strict compliance with our obligations within the ABM Treaty. An appreciation of these tenets is essential to an understanding of the SDI.

Since assuming the position as director of the program less than a year ago, we have made every effort to convey such an understanding of the program. The importance of the SDI and the implications for future peace and stability cannot be overstated.

Nevertheless, our budget sustained a 21-percent reduction in its first year. There is clearly damage done by these fiscal year 1985 cuts. We tried to minimize that damage by managing the reductions in accordance with the philosophy that I have outlined on page 3 of the written statement.

As a research program, resources are allocated and utilized more quickly than in a procurement endeavor. In fact, in fiscal year 1985 the SDI had obligated nearly 37 percent and we are now approaching 42 percent of its budgeted resources by the end of the first quarter.

This is unprecedented in a program of this magnitude and certainly shows that the program is on track, vigorously pursuing the

objectives that have been set forth, and clearly able to execute at the pace that has been programmed.

With that, I would like to just say that I am looking forward to engaging in the challenging dialogue between our citizens and ourselves.

Most of all, I appreciate the support of this subcommittee and many Members of Congress as we go forward.

With that, I am available for your questions.

[The prepared statement of General Abrahamson follows:]

PREPARED STATEMENT BY GEN. JAMES A. ABRAHAMSON, DIRECTOR, STRATEGIC DEFENSE INITIATIVE ORGANIZATION

Thank you Mr. Chairman for the opportunity to again appear before your subcommittee. If I may, I would like to highlight a few points with respect to the strategic defense initiative, or SDI, to build on our session of February 21.

Since the President's speech in 1983, we have seen many interpretations of what his vision entailed and what the SDI was expected to accomplish. In spite of what would appear to be many conflicting reports, I would like to emphasize that our goal has not changed and has, in fact, remained consistent with the direction outlined by the President. The driving force behind his concept is freeing the world from the fear of nuclear conflict. An ultimate goal is the elimination of all nuclear weapons. To move toward this objective, then, the SDI has been structured as a program of vigorous research focused on advanced defensive technologies with the aim of finding ways to provide a better basis for deterring aggression, strenthening stability, and increasing the security of the United States and our allies. I would again stress that the SDI is a research program geared to provide a future President and Congress the technical knowledge required to support a decision on whether to develop and later deploy advanced defensive systems. Such a deployment would enhance and strengthen deterrence while also providing critical leverage for truly meaningful reductions in nuclear weapons.

Further, as a research program, the SDI is not a weapons development program, nor is it a program with preconceived notions of what a potential defensive system against ballistic missiles should entail. Emphasis in the program is being given to nonnuclear weapons for defense. The defense that might evolve from the SDI will not be intended to defend only our strategic weapons systems nor is it a program that should lead to an arms competition in space. We are considering ways to defend both ourselves and our allies against the ballistic missile threat. As the work moves ahead, we are in full consultation with our allies. It is a research program designed to answer numbers of scientific and engineering questions that must be addressed before the promise of new technologies can be fully assessed. Finally, all the research in SDI will be carried out in strict compliance with our obligations within the ADM Treaty. An appreciation of these tenets is essential to an understanding of the SDI.

Since assuming the position as director of the program less than a year ago, we have made every effort to convey such an understanding of the program. The importance of the SDI and the implications for future peace and stability cannot be overstated. Nonetheless, our budget sustained a 21 percent reduction in its first year. There is clearly damage done by these fiscal year 1985 cuts. We tried to minimize that damage by managing the reductions in accordance with the following:

For new starts, we delayed the initial implementation.

For existing programs we either delayed program enhancements designed to tailor the program more closely to SDI needs, or we stretched out or temporarily i nterrupted the progress of such programs where it was possible to do so without disrupting the integrity and continuity of the program. In one particular case—the demonstration of advanced acquisition, pointing, and tracking, known as Talon Gold—we severely limited the scope of the existing program so that we could provide a major restructuring of our efforts.

For some programs we continued to fund at the rate indicated in our fiscal year 1985 budget request, because they are fundamentally important to decisions which must be made in the early stages of the SDI program.

While we were generally successful in meeting our overall strategy, achieving the planned funding levels in fiscal year 1986 has become much more important if we are to continue the goals, time lines, and tasks of the SDI.

In spite of the reductions, we have continued to move ahead as rapidly as possible with the program. In the short time since its inception, the SDI has made remarkable progress. The commitment and dedication of those involved with every element of the program is evident. In continuing to build on this solid foundation and very encouraging beginning, we estimate that the SDI will cost about $26 billion between fiscal years 1985 and 1989. Elements are again summarized as follows:

	Fiscal year 1985 appropriation (millions)	Fiscal year 1986 request (millions)
SDIO program:		
Sensors	$546	$1,386
Directed energy	376	966
Kinetic energy	256	860
System analysis and battle management	99	243
Survivability, lethality space power and logistics	112	258
Management	11	9
Total	1,400	3,722

To some, this may appear to be an overly ambitious expansion. This assuredly is not the case. The SDI is a multifaceted research program, not a business-as-usual weapons development effort. As a research program, resources are allocated and utilized more quickly than in a procurement endeavor. In fact, in fiscal year 1985 the SDI had obligated nearly 40 percent of its budgeted resources by the end of the first quarter. This is unprecedented in a program of this magnitude and certainly shows that the program is on track, vigorously pursuing the objectives that have been set forth, and clearly able to execute at the pace that has been programed.

Further, as a multi-faceted program as opposed to a "single product development", it is critical that all elements of the SDI be orchestrated in a coordinated phased approach. To provide the information necessary for our Nation to make an informed decision with respect to moving ahead with development of a strategic defense against ballistic missiles, all aspects of relevant technology must be comprehensively developed to yield results in a logical order. Elements of the program are truly interrelated. Delays caused by reductions in given areas will ultimately delay attainment of overall program objectives.

At the same time, within major projects in the program, a complete effort must be maintained as well. For example, development of a space based sensor is dependent, in part, on an integrated sensor, which is in turn dependent on focal plane technology, which is built on technology supporting new development of arrays, submodules, and modules. Multiply this by nearly a hundred fold and one begins to get an idea of the complex interrelationships that intertwine throughout the program.

As we continue to develop these technologies at a rapid pace, we build on the foundation established by Dr. Fletcher in the defensive technologies study. We are doing this, in no small measure, through the SDI systems architecture studies.

Ten contractors were awarded a phase I contract in December 1984 to perform the SDI systems architecture and key trade-off studies—known as the "horserace acquisition." The purpose of this procurement is threefold:

Provide an initial definition and assessment of several alternative constructs of systems architectures that can detect, identify, discriminate, intercept and negate ballistic missiles in their boost, post-boost, midcourse and/or terminal phases.

Provide a complete and balanced set of technological and functional requirements by developing the key trade-offs for sensors, weapons, command, control, communications (C^3), and supporting subsystems that can make the individual architecture a viable and cost effective strategic defense system.

Define and prioritize critical technical issues that must be resolved before decisions can be made on whether or not to implement a given defensive stategy.

The "horserace" procurement is a phased acquisition approach. It is divided into two phases with the second being a unilateral Government option. Phase I is a concept definition phase not-to-exceed $1 million. Period of performance ranges from a minimum of 6 months to a maximum of 12 months. Phase II, the detailed definition study, is planned to last 12 months. It is a priced option not-to-exceed $5 million. Approximately four contractors will be selected on the basis of quality and timeliness to proceed into phase II. The emphasis on timely completion gives rise to the comparison with a horserace.

In conclusion, I continue to be excited by the challenge and the responsibility for bringing this much needed initiative to fruition. In accomplishing this goal we will have pushed the level of technical achievement across a spectrum of technologies that are broadly applicable to defense needs. We will have resolved many outstanding issues about the future role and impact of such emerging technologies as directed energy. And, of course, we will give a future President, Congress. and our allies the necessary ingredients for taking the first step on the road to eliminating the destabilizing threat of ballistic missiles. I am pleased that I have had and will have the opportunity to work with you and your staffs, so that together we may ensure that the Nation and our allies understand what we are doing, why we are doing it, and how we plan to evaluate whether we have succeeded. I am looking forward to engaging in that challenging dialogue between opponents and advocates that will ultimately define that criteria for success.

Senator WARNER. Thank you, General.

I think it is important to recognize that many of the elements of this program have been in existence for a long time. That is, the concepts and the research. What the President did was essentially determine that they should be brought together, put under one authority and the President has the privilege of exercising that authority and the added emphasis that would be given to the program.

Of the budget you have today, what percentage would likely have been in place had not the President taken this initiative to emphasize the program?

General ABRAHAMSON. I would like to underscore that I agree with you that it is a privilege to be leading the thousands of people around the country who are, in a very dedicated and inspired fashion, making the programming ahead.

However, yes, much of it was a planned program previously and in some cases we have kept that plan intact. In other cases we have redirected some of the efforts slightly in order to meet our basic program objectives.

However, in fiscal year 1985 when we can make that calculation reasonably, effectively prior to any final budget examination, the program would have, had it not been cut either in the Congress or in final POM process in the Pentagon, it would have included approximately $1.5 billion of work in this area.

So, I think the irony of fiscal 1985 was that once we had defined this program to go ahead, and again taking away from the question of what might have happened in the Congress, we ended up with less money than we would have had, had we been a large number of separate disparate elements distributed throughout the services.

As we go forward into fiscal 1986, it is more difficult to exactly indicate how that program would have gone ahead because some of those things would have matured, stopped and not been carried forward because there was no program like SDI.

In other cases they would have had success, applicability and they would have been pursued further.

I would like to provide a more specific answer for the record, but my rough estimate is that between 40 and 45 percent or so of the program would have gone ahead, and that is clearly conjecture, primarily because these are some of the most advanced and very highly productive and highly leveraged technologies that can be applied clearly for the things that we are doing.

Over and above that, they will be applicable in many areas of security and technology.

Finally, some of the things will be important to our commercial technologies as well.

[The information follows:]

The pre-SDIO funding request for SDI type effort was $1.5B for fiscal year 1985 and $1.8B for fiscal year 1986.

Senator WARNER. Turning to the New York Times article by Zbigniew Brzezinski, Max Kampelman, and Robert Jastrow, how do you feel about the feasibility of having the two-tiered strategic defense advocated by these gentlemen?

General ABRAHAMSON. Of course, this was written by people who are outside of the administration. At that time Mr. Kampelman was outside the administration. He was advocating the advantages of even a partially effective system and there was value in that particular kind of system.

They did examine what we call our mature technologies and in a classified session I will elaborate on what some of those matured technologies are. I believe as far as the weapons that are associated with those matured technologies, that, in fact, that is not a difficult job.

That is clearly an engineering job in the sense that you indicated, Senator Glenn, to have a space-based kinetic device that might well provide some partial capability in boost phase and then to build on the technology that we really demonstrated in the homing overlay experiment last June for shorter range.

I would like to stress it is not enough just to have the weapons. In order for this ever to be an effective system, there must be a full infrastructure of a tracking system, surveillance system and command and control system that matches and goes with these weapon developments.

Again, I will try to emphasize that as well in the classified portion of our discussion.

Senator WARNER. Dr. Stansberry, as of today, what is the relationship with our allies on their program? Has it been improving?

Dr. STANSBERRY. Yes, Mr. Chairman, we believe that we are gathering more and more support from our allies as they begin more and more to understand the program.

One example is the communique that Mrs. Thatcher and the President issued after their discussions at Camp David around Christmas. She supports the program. She represents our allies in the sense that, as they understand our goals better and they understand that a large part of what we are doing is focused on protecting them also, they are supporting the program more and more.

Senator WARNER. Senator Glenn?

Senator GLENN. Thank you, Mr. Chairman.

General, on page 2 of your submitted testimony, which is not classified, I guess, and we can comment on it, there are a couple of questions we can handle in open session before we close that I would like to get your view on.

NONNUCLEAR WEAPONS FOR DEFENSE

You indicated on line 5 of your statement that emphasis in the program is being given to nonnuclear weapons for defense.

With nonnuclear weapons I presume you still consider the possible use of a nuclear power source for this. Is that correct?

That would not preclude powering some of these devices with nuclear mechanisms?

General ABRAHAMSON. Yes, sir, that is correct.

However, I would like to put this in some perspective. You are referring to the x-ray laser concept which is driven by a nuclear power source. As we have examined that very carefully, especially with the emphasis that has been provided and directed for the program to be nonnuclear, we feel that it is important to pursue that particular technology for two reasons.

One important reason is because we have reason to believe that the Soviet Union is also pursuing that technology very aggressively and it is imperative that we understand fully where the technology can go and what they might be able to achieve as well as ourselves.

Second, if only for defensive purposes, that is necessary. Obviously, in pursuing it through a series of tests, which are clearly within all our treaty obligations, we are also examining it to see if it can offer some great advantage as one would go ahead as a potential option.

So, that is just a fall out of examining it that particular way. However, that is a very small amount of the total effort and our major resource expenditure is consistent with the emphasis on nonnuclear means.

Senator GLENN. I am sure that will be brought up by the Soviets as to whether a nuclear explosion in space is an explosion for direct application with the power itself or whether the power application through other devices is legitimate under existing agreements.

The next sentence I was interested in because there has been some discussion as to whether we would deploy just to protect our missiles or whether it was a general population protective device that we are aiming for.

You have positively stated that the defense that might evolve from the SDI will not be intended to defend only our strategic weapons systems, nor is it a program that should lead to an arms competition in space.

In the first part of that you are talking about protecting our whole population then? Is that our design objective?

General ABRAHAMSON. That is the objective that the President laid out in his March 1983 speech.

I would like to emphasize that the real power in the architecture that we have laid out is the layered concept. It is the layered concept that gives us very great leverage, and I will show you some numbers associated with that in the classified portion of the discussion.

However, it is that layered concept that is important. So, what we are trying to build is the most effective way possible to destroy ballistic missiles as early as possible and those that you cannot destroy early, then you would attempt to destroy later. We don't know where they might be targeted.

We would be just trying to build something that is as effective as humanly possible. There is no such thing as a perfect system, I agree with that.

If we can destroy a rocket in its boost phase, one does not know if that is aimed for New York, or a Minuteman silo, but it all contributes to our security.

Senator GLENN. You would hope to develop and, obviously, we would hope it would develop in a way to protect the whole population?

General ABRAHAMSON. Yes, sir.

ABM TREATY VIOLATIONS

Senator GLENN. I understood there was quite a discussion as to whether the initial design should not be just to defend our weapons fields.

One last comment, Mr. Chairman.

On the last part of that paragraph you say:

> Finally, all the research in SDI will be carried out in strict compliance with our obligations within the ABM Treaty.

A very key part of that is "all the research." If we went ahead with the deployment of this, would this not violate the ABM Treaty?

General ABRAHAMSON. Obviously, it would depend on the specific weapons systems, but I think the answer would be yes.

The kind of weapon systems that would allow us an effective defense would certainly exceed the limits of the 100 interceptors that we were allowed to place up in North Dakota at this point in time.

So, the answer to that is yes.

Senator GLENN. That will be a big step if we get to that point to have to make that kind of decision, I gather. As research goes along, if that is the decision that we will violate the ABM Treaty, that means all bets are off?

General ABRAHAMSON. I don't think the question is so much are we going to violate the treaty. The question is what is the best way to find a structured movement away from the concept of a retaliatory deterrent to a concept of a defensive deterrent.

Of course, that is what is being discussed in Geneva today. So, we are at least trying to find a cooperative way in which the Soviets would agree that their security as well as our own would be enhanced and that it does make sense and that there would be a systematic way to make that transition.

Senator GLENN. One other question on this.

Will this have any application, as you see it now, to cruise missiles, application back through the atmosphere?

Let me preface this with a little remark. I think the way cruise missiles can be developed and thus capability that we can begin to foresee, I have wondered quite seriously whether after we have negotiated all these things at Geneva on the ICBM'S and developed the SDI concept and the capability there, if it may not be out of date and old hat by that time.

ICBM OBSOLETENESS

I don't say that facetiously at all because cruise missiles cruising at 50, 150 feet with the ranges they may have at that time and the accuracies we begin to see as potential, may make a lot of ICBM's almost obsolete.

Maybe that overstates it a little bit, but not a whole lot, I don't think. So, the question is, will the SDI concept include being able

to use any of these weapons systems as you foresee them now against cruise missiles?

General ABRAHAMSON. Sir, in terms of how that technology might apply to that, I think it is too early to say that we can clearly identify technologies now within our research program that have a high confidence that we can solve the cruise missile problem.

However, one of my responsibilities, and I would emphasize it is a secondary responsibility, is to identify which of the technologies, as we go forward, might be applied to other threats such as the cruise missile and other air breathing threats.

At this point we feel that the ballistic missile is the most dangerous and certainly the most destabilizing and the thing that arrives the fastest that puts us in a hair-triggering situation.

When the submarine-launched ballistic missiles can arrive in only 5 to 6 to 7 minutes from off our coast, that is the most destabilizing and the most dangerous of the threats we face.

Cruise missiles clearly will be a complexity factor that technology will add in the future. We are not ignoring that problem in the Department of Defense. There are several studies that are looking at that, and to assure that we have those studies conducted in an organized way so that the knowledge that we gain in our program can be applied, I am on the steering committee of several of those studies that are looking at it.

Nonetheless, we are trying to solve the challenge of the ballistic missile first.

Senator GLENN. But you are tasking your people in the whole SDI program as they do research to keep the cruise missile problem in mind also?

You have tasked them to do that?

General ABRAHAMSON. Yes, sir, just as we have a responsibility to identify technologies that can apply to many other military problems.

I don't want to let this be improperly emphasized here. Our objective and our first objective is the one that says let us go after the ballistic missile threat.

Senator GLENN. That is the immediate problem. I am trying to think about all the developments in technology here applied to what we see as a coming monstrous problem also.

Thank you, Mr. Chairman.

Senator WARNER. Senator Thurmond?

Senator THURMOND. Thank you, Mr. Chairman.

LIMITED DEFENSE WITH CONVENTIONAL WEAPONS SYSTEMS

General Abrahamson, we have received testimony that a limited defense for the boost phase and the terminal phase could be deployed by about 1995 using conventional weapons systems.

Do you agree or disagree?

General ABRAHAMSON. Sir, I believe it may well be possible and it is not the emphasis on the weapons that is the problem. The problem is being able to put together the command and control net by that period of time.

I think it is possible if there were a national decision to go ahead.

Senator THURMOND. General, would deploying such a system that would primarily defend against a disarming first strike attack enhance deterrence and stability even though population centers would be unprotected?

General ABRAHAMSON. Sir, I believe that in order to put that in proper perspective, you first must examine the way in which the Russians target, and we have a classified briefing that will comment on that.

But, in summary, their targeting is not a policy of pure and mutual assured destruction. Their targeting is, first of all, aimed at the kinds of threats that would be difficult—they have a military objective, therefore, they target first for our command and control centers; secondly, for our retaliatory forces, and for the military forces that could support Europe in case of a European NATO conflict.

Therefore, most of their missiles are aimed at those activities. It is clear that some would also damage and cause a problem for our population. There is no question about that.

I believe that any degree of effectiveness will indeed save lives. However, it may not, until it gets up to a fairly high level, offer the more complete shield that many people feel is important.

Now, the question is to reach a level where you have deprived the Soviet military planner of sufficient confidence that he can carry out that military attack so he then has to report to his boss and say, "I am not sure I can reach that military objective."

Hopefully at that point then you will have achieved a defensive type of deterrence and you will have precluded him from making an attack. Then, of course, all our populations are protected.

TALON GOLD PROGRAM

Senator THURMOND. General Abrahamson, there were some recent press reports that the Talon Gold Program may be 2 years ahead of schedule.

Is this true?

General ABRAHAMSON. I have to put that in context as well. The original Talon Gold was a pointing and tracking program that was started back in 1976 and it was aimed at being able to point or track a laser effectively against a satellite.

Therefore, many of the requirements were aimed at being able to track and point accurately at a satellite, which is a very different problem than we have in the ballistic missile area.

Given the cuts that we faced last year, one of the hard choices I had to make was to begin to look at the marginal cost effectiveness of completing that entire experiment as it was. I chose that the right way to handle that was to build on the success of the Talon Gold test program; by building on that success, then expand the efforts entirely.

What I have done is move a series of pointing and tracking experiments, not the original Talon Gold experiment, but a series of pointing and tracking experiments forward, and they are at least 2 years earlier.

They will not achieve exactly the same objective that the Talon Gold experiment sought, but I believe we have a more sound pointing and tracking experiment program that in the end will provide us with a much higher degree of problem solving for our overall pointing and tracking problem.

So, to be accurate and if I can summarize a long answer, it is not the same experiment as Talon Gold, but we have moved them forward, some of them, hopefully more than 2 years, but approximately 2 years is a conservative estimate for some of our pointing and tracking experiments.

Senator THURMOND. Thank you.

Dr. Stansberry, how long have you been on these programs?

Dr. STANSBERRY. I have been working in the Office of the Secretary of Defense for about 5 years. We have just in the last week or so gone through a reorganization to combine the forces policy aspect of strategic defense with the arms control aspect of strategic defense.

Before that reorganization I dealt primarily with the arms control policy.

Senator THURMOND. Some people feel that this program is just a dream program, it would be wonderful if it is successful.

Are you convinced as a scientist that it is practical and feasible?

Dr. STANSBERRY. I would withhold judgment. I would like to wait and see the results of the program that General Abrahamson now has laid out before making a judgment. That is the way the General has laid out the program. That is the way the President has asked for it, that we structure the program to determine in another 5 or 10 years or so, whether we could possibly field a successful and effective defense system.

I think it is premature right now to try to make that decision.

Senator THURMOND. You are employed as a scientist?

Dr. STANSBERRY. I was educated as a scientist. In the last 5 years I have been working in policy matters.

Senator THRUMOND. You have been in policy chiefly?

Dr. STANSBERRY. Yes, sir.

Senator THURMOND. In view of the tremendous benefits that might result from a successful program here, you do feel it is advisable to go forward with this research and see if it can be developed and that it would be such a strong boon to humanity, I presume?

Dr. STANSBERRY. Yes, I do. As a matter of fact, given the potential benefits not only to this country, but to all mankind, I think we would be remiss if we didn't push forward.

Senator THURMOND. It would be a tremendous boon to humanity if it were successful, would it not?

Dr. STANSBERRY. Yes, Senator, I believe it would.

Senator THURMOND. It might take the resolve out of any nation that decided it wanted to try to dominate the world?

Dr. STANSBERRY. Yes, sir. I think that is the germ of the dream that the President had. He probably has a better perspective on the problems because he was faced with considering the question of whether to use nuclear weapons if it appears they are being used against us.

I think he believed that is a position he wanted to try to get out of. The speech of March 1983 reflected his desire to want to change fundamentally this position that the United States is in.

Senator THURMOND. I will ask you both this question.

Has President Reagan definitely committed himself to this program to go through with it?

General ABRAHAMSON. Sir, our direction is to aggressively, just as aggressively as possible, and effectively as possible, of course, to proceed with the research program.

The research program, of course, then is to provide the answer either for this President or a following President or future President, maybe a future Congress, so that they can make a decision about the development and deployment phase of such a program.

So, I think there is a very strong commitment at all levels in the Government, and I would like to stress also at the levels of the people who are working on the project, to conduct this research program and to try to find these answers that would allow us then to have a truly practical and effective option for a future decisionmaker to make the decision to go ahead.

Senator THURMOND. Our country has made such strides in the space program, putting a man on the moon, doing all those things. If we can do those things, do you feel we have a chance to make a success out of this program?

General ABRAHAMSON. Sir, I have been privileged to see what the technical community in this country can do when they are given a goal and when it is a goal that they believe in. There are many of us who can see that.

As I say, it has been my privilege to see that quite intimately, just as it has been Senator Glenn's, and I believe that we can do anything that we decide to do so long as there is the proper resolve by the Nation, by the people as a whole, to meet that objective.

Senator THURMOND. In view of the great benefits that could be derived from this program, you do feel it is advisable to put in the required money to test it thoroughly to see if it can be successful?

General ABRAHAMSON. Yes, sir, I do. I think in terms of perspective, if one looks at the $26 billion that we laid out over the initial 5 years of the program, that represents about 2 percent, a very small percentage of the projection we would make for the entire Department of Defense budget over that same time frame.

I think that is a good investment, given the potential, the real possibility, that this may have not only for the United States, but for all mankind.

Senator THURMOND. If this program proves successful, will that enable us to reduce our defense expenditures to a great extent?

General ABRAHAMSON. I think that in the future if we were not able to proceed with a defense, I believe that a future Congress would be struggling with how does one keep pace with new technology and new developments that the Russians are laying out in their offensive forces, and I think it is very difficult to imagine what those expenditures might be, but I think they could be very, very major.

In each case it is a problem of continuing this offensive arms race. If we can move it over to a cooperative defense, that clearly

does provide us options for protecting our people, in a sense it is a sincerity test for the Russians' objective in the world.

If their objective is moving to the point that they are really trying to just defend their nation and their people, then the promise of an effective defense would be worth the expenditure on their part and our part.

If their objectives remain bellicose and remain the kinds of objectives that they would like to be in a position to either, through nuclear blackmail or through other means to project their power in a way that is going to be a threat to the security of the people of the world, then they may not be willing to accept this idea.

So, I think it is a good sincerity test. In terms of your specific question, I believe we could avoid substantial expenditures in the future. Not yet because we have not proven the research, but we can avoid expenditures in offensive arms and a very, very difficult problem in the future.

Senator THURMOND. Thank you, General.

Senator WARNER. Senator Hart?

Senator HART. General, aside from calling for an increase in research by about a hundred and fifty percent, what other elements of the President's proposal are there?

SDI, AN EXPENSIVE ONGOING RESEARCH PROGRAM

In other words, isn't SDI at this point just an enhancement of an ongoing rather lengthy and expensive ongoing research program?

General ABRAHAMSON. It is a program, as the chairman asked earlier, built on research that was already ongoing in the Department of Defense budget, sir, a very substantial research effort based on, as I indicated earlier, some of the most promising technologies that are available.

So, that for a large percentage of it, yes, that is the case. Now we are increasing the pace in that and in some cases modifying some of the objectives, but it is based on a very firm and longstanding research trail, that is correct.

Senator HART. So, all the excitement right now about the SDI, given the conditional language in your testimony and that of Ambassador Nitze and others, really avails us nothing until we find out what all this research will produce, is that correct?

As you well said in your testimony, a future President will make the decision, not this President.

Testimony before this committee and other committees has indicated it may be 15 years before we know whether or not key components of the broadly defined SDI are going to work.

So, any impression on the part of the American people that in the second Reagan term we are going to make a command decision whether to go forward with the broad-based SDI is incorrect, is it not?

General ABRAHAMSON. I believe that there are certain mature technologies that by the end of the decade one can make this kind of decision and I believe that we will be beyond this President's term.

I don't like the emphasis that in fact it could potentially be some 15 years of research before one begins to understand that we could

go ahead and that some element of the program could be put in place which could provide some initial protection. I think that is an overestimate of the problem.

Senator HART. That is why I said broadly defined. I am trying to get from component SDI to broad-based SDI. Most of the public debate has been about broad-based SDI, should we shift our strategic policy from one based on deterrence to one based on defense? That is the policy question.

One of the things that is confusing the Members of Congress and the public is whether SDI is point defense or population defense.

When others talk about broad-based SDI, we are talking about the big shield that the President is talking about over the whole country. I gather that although some elements of such a system may be ready to go in the meantime, that it will be at least a decade, if not more, before we will know whether or not the whole shield concept is feasible?

General ABRAHAMSON. I believe that we will be able to begin to have a sufficient base of understanding that by the early 1990's a reasonably confident decision can be made. I just offer the early 1990's in opposition to the idea it might be 10 or 15 years.

Senator HART. A decision on population defense?

General ABRAHAMSON. To be able to move into the initial portion of a layered defense, yes, sir.

Senator HART. The initial portion of the layered defense is point defense, ballistic missile defense, which we already know we have.

General ABRAHAMSON. No, I don't agree that that is necessarily the first thing that one might try to put in place.

Senator HART. What would that be?

General ABRAHAMSON. I believe that the technology that we have demonstrated already, for example, the homing overlay experiment, was a marvelous demonstration of technology that I believe has been misinterpreted just by the fact it was launched from a rocket out at Kwajalein.

Remember, just to review what we did, there was a missile, a Minuteman missile, fired from the Vandenberg Air Force Base. It had a simulated Soviet warhead on it and we intercepted that missile in space many hundreds of miles away from Kwajalien and we just happened to fire a rocket from Kwajalien in order to get the interceptor to that point.

So, I believe that there has been a mistaken impression that what we demonstrated there was that we had the technology in hand for terminal defense.

I think a much more accurate interpretation of our technological demonstration was that we demonstrated that we could intercept a warhead coming in at nearly 15,000 miles closing velocity, that is an incredible rate, and that meant that our guidance system had to really be a hyper form and guidance system, and it demonstrated that we had the technology to be able to see that warhead on the way by using infrared techniques.

What does that mean? That could have been fired from a submarine and it could have been used as a post boost system. Had that been based in space, I believe it could have been used as a partially effective boost phase system.

It is important to recognize that we have already demonstrated the practicality of several layers of the defense.

Senator HART. And it would be your recommendation to some future President to go forward with the elements of these individual layers as they prove technologically feasible?

General ABRAHAMSON. I believe there have to be three elements of that decision, sir.

I think that the feasibility of the technology is only one element.

I believe we also must prove that it is affordable and, therefore, a major part of our research program is aimed at bringing the cost of these systems down to something that would be practical and could be implemented.

Third, then is the political dimension and security dimension of the decision, and it is very difficult to project what that one might be.

I think a future President must, in fact, be able to say that it is clear that even an initial partial development and deployment decision would also be a step down this trail of reducing the level of risk in the world and increasing our overall security. That part of it, of course, depends on the world situation at the time.

SDI, COUNTERMEASURES AGAINST SOVIET DEFENSES

Senator HART. Now, part of the SDI research includes so-called countermeasures against Soviet defenses, does it not?

General ABRAHAMSON. Yes, sir; and in the classified session I will show you some examples.

Senator HART. You subscribe to the Nitze formulation, rather common sensical formulation that all elements of the system or the system broadly defined have to be cost effective on the margin?

That is, in your formulation about affordability, it has to be cheaper to put up the defenses than it is to overcome them?

General ABRAHAMSON. That is a critical factor in the whole equation. I called it fundamental cost inequality. We are putting a great deal of effort as to how it is you can bring these costs down so that becomes a real factor.

Senator HART. In the future putting forward one or more layers of the system would presuppose that it was more expensive for the Soviets to overcome those systems than to put up defenses of their own?

Is that an accurate statement?

General ABRAHAMSON. That, of course, is the direction we are trying to convince them that they should go to because that is nonthreatening to us. One factor in pushing them in that direction is the resource factor.

Now, expensive, that is a difficult problem to figure out. They don't calculate their things the same way we do. You know the problem of converting their rubles to dollars. But expensive in terms of commitment of their production facilities, commitment of their best talents, commitment of their operational forces, I think the answer is yes, that is absolutely the case.

Senator HART. In a word what we are trying to do is drive down the cost of very expensive and heretofore mostly exotic technol-

ogies to a point where they are less expensive than the cost of technologies to overcome those systems on both sides?

General ABRAHAMSON. On both sides.

Senator HART. How would you feel as adviser to the Commander in Chief if you knew the Soviets had a 5- to 10-year advantage over us in defenses?

If you knew the Soviets could defend against an American nuclear attack, and I don't know that degree of effectiveness here, 20 percent, 40 percent, 70 percent, and it would be 10 years before we could catch up with them, would you think that would be a stable situation or one that the United States should feel uneasy about?

General ABRAHAMSON. I think the Secretary of Defense has already stated that that is one that we should feel uneasy about. However, I would like to point out very particularly that this is not a game, the third chapter of a game theory book.

We are talking about a Western technology and a Western capability that is backed up and supported by, and is used or not used, based on the morals and the precepts of our society.

That is quite different from the decisions that 10 men in Moscow might make. Therefore, the game theory approach that says that if the United States has this, how would the Soviets feel, is a clear reasonable kind of position to consider, but what their actions might be and what our actions might be are very different.

Therefore, I would like to stress that I think it is more complex than many people have stated in this area that says, well, if we do it, how would they feel, and if they do it, how would we feel?

We must consider that, but the real potentials for action are different.

Senator HART. I agree with that, but we are talking about perception, not some neutral detached observer here. I hope what you are not suggesting here that the Soviets trust us more than we trust them because we are superior morally.

General ABRAHAMSON. No; I was not suggesting that, but I was suggesting that we have different decisionmaking and a different basis for all our decisions and that is reflected in everything we do. It is reflected in the way we build our force structure. It is reflected in our war plans, and I do think there is a difference.

Senator HART. I must say in closing that I agree with you with one exception and that is the MX missile. That very point is the reason why I am opposed to the MX because it is the first time that we have designed a nuclear weapon system and put it in place that we knew was vulnerable.

That sends a much different signal to the Soviets than we have sent before.

Thank you, Mr. Chairman.

Senator WARNER. Thank you, Senator Hart.

Senator GLENN. Mr. Chairman, could I make one comment?

Senator WARNER. Yes.

Senator GLENN. I want to follow up on Senator Thurmond's comments and line of questioning a minute ago.

I think perhaps Americans have come to expect exactly what you said, General, we can do anything we have set our minds to. We have a pretty good track record doing that.

In question and answer periods after speeches, I have had people ask such questions as why don't we set a 10-year goal and go? That is what we did on going to the moon, and we can do it.

I think it is well to point out that pursuant to Senator Thurmond's comment a little while ago, this is a wholly different ball game. This is not the same thing. When the decision was made to go to the moon, we did not need to make one scientific breakthrough. It was an engineering problem.

We knew the thrust of rockets and all the things that go into them and the structure and the whole works. It was a matter of working out the weight and thrust and putting the whole thing together in a series of vehicles that would take us to the moon and back and we had to do some development of guidance and things like that.

It was not a simple little thing, but it was basically an engineering problem. It needed no scientific breakthroughs as such.

This whole program is completely different. We need to invent the laser, we need to invent the physics and technology that will do this, then we get on with the engineering.

I just want to make that comment, it is a completely different problem here than setting a goal and going ahead gung ho. It is a matter of inventing the physics and technology and that is what you are doing with this research.

Senator HART. If I could add another note, I notice at the time when we are talking about putting huge exotic, potentially nuclear-driven, nuclear-generated directed energy systems in space, we are still having trouble getting Senator Garn up there. [Laughter.]

General ABRAHAMSON. I won't comment on that. [Laughter.]

Senator WARNER. General, on behalf of Senator Wilson who was unable to join us today, he requested that the chair put this question to you.

FUNDING FOR DEPLOYMENT OPTIONS

Should this Congress make a decision that it wished to fully fund a program to provide for the earliest possible nonnuclear, ground-based defense of our land-based strategic assets—and I am sure he meant by that the submarines, land-based missiles and bombers, he was directing attention to the missile force—how soon could you offer to the President and the Congress deployment options?

General ABRAHAMSON. Rather than just make an immediate judgment, I guess I would like to provide that answer for the record, sir.

As I indicated previously, the long pole in the tent in just about every case is the command and control structure that goes with it. Therefore, that is an important element of the research program that we have moved forward.

I am not saying we are building a command and control structure. We are trying to find ways that will allow us in the future to build such a command and control structure in a reasonable length of time. That is the key element.

I would like to answer that for the record.

[The information follows:]

From a standing start, which is essentially where we are now, we estimate that deployment of a terminal type defense could begin in about 4 to 5 years. I reiterate that this is only an estimate of how long this endeavor might be. I believe, as I stated before, that the long pole in the tent is the command and control structure.

Senator WARNER. Thank you, General.

This is the second opportunity for the subcommittee to have a chance in open session to hear you and your answers to our questions.

The subcommittee has not had the option to receive classified testimony. Therefore, at this time the Chair directs the subcommittee go into executive session.

We will resume as soon as the staff advises me that we are secure.

[Whereupon, at 10:06 a.m., the subcommittee proceeded in executive session.]

EXECUTIVE SESSION

Senator WARNER. The Chair is informed that the hearing room is now secure.

You may proceed with your classified briefing.

General ABRAHAMSON. Thank you.

I would like to start by introducing Dr. John Sellers from the DIA. He has a briefing that I think pulls together the threat and threat problem very concisely. He wants to cover a lot of ground quickly.

SOVIET BALLISTIC MISSILE PROGRAM

Mr. SELLERS. I will give a brief rundown on what the Soviets are doing in their ballistic missile defense program. The Soviets have very real interest in ballistic missile defense.

We have information from several sources indicating that they started their ballistic missile defense program at the same time they started their research on ballistic missiles following World War II in the forties. They recognized the future threats and they started to develop defenses against them.

[Deleted] they were testing the first generation ABM systems at Sary Shagan in the fifties and maintained an active ABM defense in Moscow, deployed in the sixties and which is currently maintained and ongoing.

We see that their ABM testing has continued from initiation to this time and is still ongoing.

The ABM Treaty was signed in 1972 for the purpose of eliminating ABM defense as a factor in the strategic balance. On the United States side it had the effect by curtailing our defensive program. We stopped deploying our ABM. We cut back on research and cut back on anti-aircraft defense.

In the Soviet Union basically no effect, still massive anti-aircraft defense, [deleted] SAM interceptors deployed, for example, and no effect in the continuation of the development of their ABM systems.

[Slide deleted.]

This is a rundown, basic outline of the remainder of my briefing. I will go a bit into what they are doing at Moscow, where they are

now putting in a new ABM system, deploying large radars around the Soviet Union that we think are potentially long-lead time components for development of ABM defense.

I think it is the more ominous because we see them developing a rapidly, deployable ABM system.

We also believe some of their SAM systems may have a potential for an ABM role as well, one of those being a completely mobile system.

We believe their R&D supporting future options using new technologies such as directed energy weapons.

First, I just want to get one point across. Not everybody seems to understand this, that the strategic air defense force of the Soviet Union is a separate armed service just like the Army, Navy, Air Force and strategic rocket forces. [Deleted.] That is the organization that is responsible for running the air defense's [deleted] SAMs deployed throughout the Soviet Union.

This is also the organization that has the responsibility for running the Soviet ABM program. It is reasonable for ABM defense and for anti-space defense.

As I indicated, they installed an ABM system in the early sixties at Moscow. It was actually started in the early sixties, but all through the sixties it was constructed. [Deleted.]

Senator HART. Have they tested that missile yet?

Mr. SELLERS. [Deleted.]

Senator HART. What is the designator?

Mr. SELLERS. [Deleted.]

There is the large radar they are also putting in as part of the new Moscow ABM system.

[Deleted.]

We believe the radar will take over the function of the target tracking radars [deleted].

[Deleted.]

Senator HART. Is this the same configuration as Krasnoyarsk?

Mr. SELLERS. No, sir, totally different.

Senator GLENN. Are there a series of these now because this is such a beautiful target?

How dependent are they on that specific system working?

Mr. SELLERS. [Deleted.]

Senator WARNER. You talk about a destabilizing first strike incentive.

That is one, isn't it, to protect that, they put this whole investment in their ABM system, they would have to really think about taking off that full load.

Does anybody wish to respond?

Dr. STANSBERRY. Mr. Chairman, [deleted].

Senator WARNER. We talk about the MX system being destablizing and D–5, but this is really one pinpoint target.

General, do you have a view on this?

General ABRAHAMSON. The reason that I haven't commented is because a little later in the discussion here Dr. Sellers will comment on their theory and their doctrine in terms of the way they would operate.

They certainly believe, and have from the very beginning, that in a crisis situation there comes a time when it is right for them to make the first strike.

Mr. SELLERS. [Deleted.]

[Deleted.]

As I mentioned, we are concerned because we can see them putting in a large new network, a second generation system, of long-range ballistic missile tracking radars.

[Deleted.]

They also have a HenHouse network, the first generation system. So, this gap is not a real gap.

The one that is labeled new radar is the Krasnoyarsk radar which you can see here [deleted].

The Soviets under the treaty are allowed to put early warning radars on the periphery.

Senator GLENN. None of that has over-the-horizon capability?

Mr. SELLERS. They have three over-the-horizon systems two of which face the United States, but those are different locations and completely different design.

Senator GLENN. These are strictly line of site?

Mr. SELLERS. That is right.

This shows a comparison between the one at [deleted].

[Deleted] they are pursuing space-based laser weapons as well.

Senator GLENN. Could you follow up on that last point for a second?

Mr. SELLERS. I will be coming back in 1 minute.

General ABRAHAMSON. We are limited by the rules, Senator Glenn. If you would like to go to a higher classification——

Senator WARNER. What rules are you referring to?

General ABRAHAMSON. The room. We can go at higher levels in another forum and for any of you who would wish to do that, we can, of course. It provides additional details behind some of the ones we are talking about.

Senator GLENN. Is this room limited, Mr. Chairman?

Mr. SELLERS. [Deleted.]

Senator WARNER. At Senator Hart's request, and I concur, we will establish a date so that this subcommittee and other members can receive the full briefing.

Mr. SELLERS. [Deleted.]

[Deleted.]

They are very advanced in real technology. Some of the components of the U.S. effort have been taken from Soviet technology.

Senator GLENN. Is this satellite to satellite?

Mr. SELLERS. The antisatellite aspect would be. This development of lasers in space would be for use of lasers from one space location to another space location, whether it be ballistic missile or antisatellite.

Senator GLENN. If they are concerned about our whole star wars concept, obviously, the defense against that, the first thing they would do is try to knock out our stuff already up there in a stars wars deployed mode.

They could do that in a low-powered laser, perhaps a 1 megawatt.

I was wondering whether they are developing something already in advance of our star wars that we have developed defenses of our star wars system for? I know we are concerned about that.

General ABRAHAMSON. The answer is yes, we have to be concerned that these are potential ways they would try to knock out our system and that is why our countermeasures program is so vital.

Senator GLENN. Is this something against our satellites as opposed to a star wars system of their own?

General ABRAHAMSON. It could be both.

Mr. SELLERS. It has application to both. This predates our SDI Program by many years.

This is not a response to SDI, but it certainly has application, both counter SDI and ballistic missile defense and antisatellite defense.

Senator EXON. On that line, Mr. Chairman, could I ask a question?

Senator WARNER. Go ahead.

Senator EXON. You indicate the ABM role is affected.

Is that ABM role designed to protect missile fields or is it general area defense?

Mr. SELLERS. [Deleted.] We see them deploying around Moscow. [Deleted.]

This shows the Soviet large space launch booster called the SLW. It demonstrates the Soviets will have a capability to lift prototypes of these weapons up for testing in the nineties. This booster can lift their version of the shuttle, their space shuttle, into orbit.

It also has more flexibility. The tank has engines on it. It can be launched without the shuttle, so it can lift 100 to 150 metric tons in Earth orbit.

We think that that will give them plenty of capability to do testing of these through the nineties and eventually deployment of space-based weapons.

What I have attempted to do [deleted] the various ongoing Soviet programs, some of which I discussed which have been ongoing for some time.

It is not meant to be showing a response to SDI. It has been ongoing for a decade or more. I am showing it in a SDI context.

These are breakdowns of SDI component elements. The attempt is to show they have a very broad based program that could support SDI types of systems.

These are the programs that some of their future ABM development will grow out of.

Finally, concluding, I have indicated the Soviets have had an early history with ABM that predates United States pursuing ABM defense. We believe this is derived from the doctrine that requires them to defend themselves where they reject the concept of mutual vulnerability or mutual assured destruction. If you look at what they are doing, just deploying air defenses, it obviously rejects that type of concept.

We see them putting out these large radars around the periphery and developing rapidly deployable systems. We are concerned the Soviets may be preparing for ABM defense of their territory.

We believe, the final point is very important, we believe the pursuit of ABM defense in the Soviet Union is driven not by whether or not we pursue SDI, but driven by their own requirements for defense of their national territory and they will pursue SDI type of ABM systems independent of whether or not the United States does.

SOVIET PLAN OF ATTACK

Senator WARNER. I thought we were going to hear what their plan of attack will be.

Mr. SELLERS. I can comment on that. It is another element. I can try to comment on that.

We do believe they believe that a preemptive strike, counterforce strike, is the most important aspect. They are targeting all military objectives, as I think General Abrahamson laid out pretty well, going against command and control, offensive nuclear weapons.

They have structured their offensive forces to meet that. They require [deleted] targeting on very hard targets.

They require [deleted] targeting on soft targets.

Because of the large deployment of SS–18's and SS–19's they deployed through the seventies, we believe now in the early eighties they have [deleted].

Their doctrine also requires [deleted].

They are currently working on that aspect. They are also in the pursuit of the newer generation ICBM's which have mobile components and [deleted].

Senator HART. Given all this, what incentive do they have to negotiate limits on space-based systems?

I don't reconcile all this development with their diplomatic posture except for political objectives.

Mr. SELLERS. They are using the negotiations like they used negotiations back in 1972 to try to stop the U.S. program while they proceed.

Senator WARNER. We are not that big enough fools.

Mr. SELLERS. I hope not.

Senator WARNER. The question is important and we ought to try to analyze it more thoroughly.

If they have this enormous program under the general classification of SDI in progress, what leads us to believe that they are going to scrap it if we were to scrap comparable efforts, really not comparable, but just the beginning of it?

We are getting in the arms control area. I realize this may be beyond your province.

General ABRAHAMSON. This is a difficult area.

First of all, the simplest and easiest way for the Soviets to maintain the thrust of their program and their thrust toward superiority is to help us talk ourselves out of this program either by eliminating, and I don't think they think that is possible, or by providing sufficient motivation that we underfund it and, therefore, cause us to go slower.

It is very real, you can proceed with a research program and not know much about it. It is easier to do that, of course, in the Soviet Union.

I think it is quite clear that the ABM Treaty did not stop them from pursuing their objectives in terms of ABM defense, first in the conventional area and now they are planning to build on that and later on as their technology has improved, to build towards the possibility of a space-based defense as well.

Senator WARNER. If you used the figure of $3.7 billion that the President requested as a baseline, would you have the ability to draw a parallel figure for the Soviet Union?

Mr. SELLERS. We have looked at that. We have initiated some programs to do it, but we are months to a year away.

Senator WARNER. Any answer would be imprecise?

Mr. SELLERS. It is very difficult to do. We have estimated that there are estimates like on the laser area, [deleted] amount of effort, depending on how you want to measure, for example, by the [deleted].

It is significantly larger than what the United States has done.

The spending on the strategic defense forces is comparable to what they are spending on intercontinental attack forces. That includes all the air defenses they are putting out.

Senator HART. What would it cost us to duplicate what they are doing?

General ABRAHAMSON. Sir, those are frustrating questions and we are frustrated that we can't answer them very well.

I don't believe that we have an intelligent comment that we could make. I am not sure we have a good effective way by which we can translate our program that runs on dollars and is appropriately measured in dollars in this country to their program where I believe it is measured more in terms of number of people and the other kinds of resources that are critical.

Therefore, we have continually been frustrated by attempts to translate.

[Deleted.]

Senator EXON. May I take a crack at this?

I think this is a tremendous challenging, interesting line of questions being carried on here, General. You know, when we see and hear these kinds of things, we become very much concerned about where we are going.

I say, without questioning what you are telling us or your views, that we went through quite a period of "the Russians are coming." We went through periods of the window of vulnerability and it turns out there was no window of vulnerability from everything I can now reasonably understand or appreciate.

I guess what I want to know without going into a whole list of technical things is, whether knocking out a high-flying satellite, is only a step away from taking out incoming ICBM's? Maybe not a giant step, but at least a distance away from it.

Do you feel, General, from what you know that the Soviets are in a posture right now to have an earlier breakout in these areas of ASAT and ballistic missile defense than we do?

And a followup question to that, it seems to me, is whether or not you believe that with regard to arms control the Soviets are now back to the bargaining table seemingly most concerned about our assumed technological superiority in this whole area. Are they concerned that if we continue with the SDI, we are going to start a

new space arms race when indeed, they may be the ones out in front in such a race?

Or, to put it another way: Are they more concerned about our catching up with them and then leaping out ahead of them?

Do you understand what I am trying to get at?

General ABRAHAMSON. Yes, I do.

I guess I have now searched my own feelings about this so I will give you my own personal answer because that is what you asked for.

I believe that of most concern is their long-term thrust as opposed to where they are right now in the modern concept of the SDI.

[Deleted.]

If you contrast what they have done as opposed to what we did in this country, and this goes back to my answer to you, I believe we made a sincere effort to essentially leave ourselves naked and that was the concept of the ABM Treaty, that we would leave ourselves naked in the hope that in doing that they would, in turn, do it with us, limit their building that offensive arms race.

I think it is quite clear that that has not worked out. All of the evidence is, and that is very clear and I think it is quite controversial, that that has not worked out.

What they have done is put themselves in a position to move from what to us is a trivial kind of defense around Moscow at this point to what would be certainly of much more concern.

Senator WARNER. Let me try a question, one that troubles me greatly.

SDI NOT LEAKPROOF

As we look at the SDI for the moment I am convinced there is no such thing as leakproof SDI. It is a question of quantum of leak.

Assuming there will be some leak in their system, the same as any we may devise, and assuming that a very small number of warheads could probably cause the amount of damage [deleted] render it a wasteland, and, indeed, a certain amount of leak is likely to put that big radar in jeopardy, why are they going ahead with this development?

They have to assume that will be imperfect. Have I made myself clear?

General ABRAHAMSON. I understand what you are saying.

Ken, you might like to answer this and, John, I might want your help on this.

I believe the assumption of what you are saying, the rock bottom of it is, well——

Senator WARNER. First, how many MX warheads [deleted].

General ABRAHAMSON. I would have to defer to our targeting people in terms of what it would take [deleted].

However, intent is always very difficult to read. When we are talking about the survival of civilization, I think you have to go a little beyond intent.

When you go to the next step which says what are they doing and what might they be capable of and under what circumstances would they reconsider this, under what kinds of escalation circum-

stances would they finally reach the point that these 10 men can get together and say I think we had better strike and we had better strike now and strike first, it is very hard to predict when you reach that point.

I don't believe that, as a Dutchman who is in the nuclear planning business, put it to me, after we had discussed SDI very dramatically for a long period of time, he said in absolute frustration, don't you know that nuclear war is impossible and beyond that don't you know that the fact that nuclear war is impossible makes the idea of general war impossible?

In other words, if he is right, if that is really the case, then you know there is an awful lot of what we are doing that perhaps does not make sense. But I don't believe that.

Senator WARNER. Gentlemen, the floor is open for more questions.

Senator EXON. General, I like the way you answer questions. You are a military man. Even as a military man you talk on a level we lay people can understand and I congratulate you on that.

Dr. STANSBERRY. You covered it fairly well, General. It is difficult for us to deal with Soviet intent and what our perceptions of their intent might be. We have to deal with what we see as reality in the way they have developed their force structure and their supporting command and control and their hardening of leadership facilities and all of that, the way they have gone through that process.

And, Mr. Chairman, you pointed out about this radar, the whole structure looks as though it is much better suited for the aggressor who carries out the first strike and then tries to respond in a defensive fashion against a retaliatory strike.

What we are trying to do, what the President has asked in his initial speech was to find some kind of mechanism using all the technology that we have made ourselves famous for, find some kind of mechanism of getting out of the box that that puts us in.

Senator EXON. Let me get back to some basics here.

You have your mission to carry out and I think you are doing an excellent job. I congratulate you on that. We have our mission to carry out and we have to ask these penetrating questions to make sure that just because the President goes on national TV and comes up with a plan to protect us from most incoming ICBM's, that we have to go ahead with it. Still, I do suspect the President of the United States is a little more of an expert on this than Jim Exon is.

When you tell us it is difficult for us to come up with perception of intentions of the Soviet Union, I recognize that is important. That is why I ask these questions.

WINDOW OF VULNERABILITY

Do you feel there was a window of vulerability in 1980?

Dr. STANSBERRY. There is no question that the Soviet ground-based ICBM force has developed a capability to the point where they can threaten the U.S. ICBM force.

Senator EXON. That answer looks at the ICBM in isolation from the other components of our triad. With the full triad in mind, was there a window of vulnerability in 1980?

Dr. STANSBERRY. That is the way I was going to follow up.

One of the big advantages we get out of the triad is that in order to attack that, in order to try to disarm the United States, it presents a very difficult problem for the aggressor in being able to coordinate an effective attack.

Something that is effective against our ICBM's is not effective against SLBM's, it is not effective against bombers.

The synergism we get in a defensive sort of posture out of our triad is a large element of benefit of the triad.

Senator EXON. Then is it a fair interpretation of your answer that we may have a window of vulnerability with regard to Soviet-based ICBM's against our land-based ICBM's, but we did not have a window of vulnerability when we put the total Soviet forces against the total U.S. forces? Is that a fair summation?

Dr. STANSBERRY. I think that is a fair summation. It is consistent with the Scowcroft Commission's findings in their search for a basing mode for the MX.

Senator EXON. The Scowcroft findings were after the window of vulnerability charge.

I am not talking partisan politics here. I think the Democrats made an issue back in some earlier Presidential elections about some weakness that we had.

I think the window of vulnerability was just as phony a charge, and I bought both of them. That is why I keep pressing for these things to make sure I am not fooled again.

Senator WARNER. Would the Senator yield for me to make an observation?

I think we overlook one very important consideration when we deal with this question of window of vulnerability, parity of forces, essentially equipment and the like. That is right in your back yard. That is a targeting doctrine. If you look at the degree of hardness that the Soviets have achieved by dispersal of their systems, the fact the Soviet have three times larger land mass than the United States and with the rough equivalent of warheads, it seems to me that we are at a disadvantage because of the hard targeting issue.

General ABRAHAMSON. That is correct, sir. As we look at their targets and as they look at ours, our forces are presented with [deleted] hard targets which are, of course, military targets and that is what you are trying to do.

Senator WARNER. How can your colleagues say rough equivalence in response to Mr. Exon's question?

Indeed, there is not an equivalence.

Dr. STANSBERRY. I am sorry if my comment was interpreted as rough equivalence. I did not mean to say that.

Senator HART. He said in terms of balance of forces, there was no window of vulnerability.

Senator WARNER. How do you crank in the targeting?

Senator HART. That was not the issue. The issue was in 1980 was there a systemwide window of vulnerability? The answer is no because of the triad. Is that right?

Dr. STANSBERRY. Yes, sir.

Senator HART. What you said contradicts [deleted]. I think that statement is nonsense. That is my view.

General ABRAHAMSON. Sir, just for your guidance, we have a much more programmatic discussion which is at the classified level which takes approximately 30 minutes.

On the other hand, obviously this is a very important discussion and I will yield to your judgment in terms of timing.

Senator WARNER. I defer to my colleagues here as to what their wish may be for whatever time remains this morning that you are available.

We will conclude on the note, since Mr. Hart requested the highest possible classification briefing, you may present your case and then we will invite the Central Intelligence Agency to present their case so that we can clear up any disparity of viewpoint.

Senator HART. Is the Agency disagreeing with anything you have said today?

Mr. SELLERS. No. I think we all are in basic agreement.

Senator WARNER. This is the most important thing we have to grapple with.

Senator EXON. No question about that, Mr. Chairman.

TARGETING ISSUE

Senator WARNER. I still have questions on the targeting issue.

Senator EXON. May I ask another question on that?

Senator WARNER. You are the targeting expert. Let us get this thing out on the table.

Senator EXON. I am not an expert in anything, Mr. Chairman. I am adrift at sea, frankly.

Let me ask this question. In your opinion, can we meet our target objectives today with the forces that we have in existence?

What I am trying to ask is what base are we going to start from?

General ABRAHAMSON. Sir, I am not expert enough to answer that question. We will take that for the record and we will provide you an answer.

[The information follows:]

[Deleted.]

Senator EXON. Is there anybody here who can comment on that?

I would appreciate your answering that for the record. I certainly endorse what others have said about having a meeting so that we can go into this further.

I apologize for not being here for the very first part of the meeting, but I guess one fact that shows through in your presentation is that evidently the Soviet Union is prepared, if necessary, to give up all the Soviet Union and protect Moscow and their top leadership. It seems they would basically sacrifice the rest of the country if it came to that.

Is that the bottom line doctrine?

Mr. SELLERS. No, I don't think that is right at all.

They agree to limit the nature of ABM defenses to just Moscow because they made substantial gains on the U.S. side back in 1972.

You talk about why they agreed in 1972 to limit the ABM and then only put one in Moscow. The intent of the ABM Treaty was to remove the ABM defense factor from the strategic balance.

The United States, as a result, got rid of everything. I think it speaks to their intention, the fact that they have maintained an

active defense of Moscow. They have retained as much as they can under that agreement.

In the meantime, what they did at that time, they were not ready with a counterforce capability. Had we deployed ABM to defend our Minuteman silos, that would have greatly delayed their achieving counterforce capability.

They have now achieved that counterforce ability. They are in a better position to deploy ABM. They have not ignored the defense of the rest of the Soviet Union, the hardening, the extensive bunkering is throughout the districts of the Soviet Union, too.

The air defenses are not just in Moscow. They are everywhere in the Soviet Union, very extensive, all they have been doing, where they have valuable targets throughout the Soviet Union they want to defend.

I think they agree to limit the extent of the ABM defenses as long as they get a concession on the U.S. side that they perceive as a military advantage to them.

Senator EXON. Let us see if I understand this. The information that you presented today indicates to me at least that their first goal right now so far as you can tell would be to put our eyes out by attacking all our critical satellites.

That is the thrust of their research at the present time?

Mr. SELLERS. I wouldn't say that is the thrust of their research. That is one thrust. They are pursuing ABM, and pursuing antisatellite capabilities. They have had an active antisatellite system since the early seventies.

Senator EXON. We know about that. That is essentially a blunderbus type of system, isn't it?

General ABRAHAMSON. I think in this way, it takes time to operate. [Deleted.] Our present system is vulnerable.

Senator EXON. Our low orbiting systems?

General ABRAHAMSON. [Deleted.]

Senator EXON. So, we should not take comfort in the fact that at the present time they have less than a sophisticated system that can reach only the low orbiting satellites.

General ABRAHAMSON. They know that system works. They have tested it against low systems. [Deleted.]

Senator EXON. Thank you, General.

Thank you, Mr. Chairman.

Senator WARNER. Senator Glenn, do you have further questions? If not, we will leave the record open for additional questions from members to be submitted. General, were you finished?

General ABRAHAMSON. We do have, as I indicated, a much more programmatic and in depth look so that you begin to get a better feel for where we are and what we are doing in the program.

I will be happy if, as a matter of time, you would like to handle that in another way, either personally——

Senator WARNER. I would suggest that those of us present this morning recognize the continued importance of receiving information from you.

Subject to scheduling, what we will do is have a briefing at which time we will give you an opportunity to cover the programmatic presentation, although some of it is unclassified and then we will move right into the classified.

Senator GLENN. I think we have spent enough time on the other today. I would like to go through programmatic stuff. The programmatic stuff is not all classified?

General ABRAHAMSON. There is some that is highly classified, some is secret and some is unclassified.

Senator GLENN. I am reasonably familiar with this material. I would like to make sure I am up to speed on it.

Maybe you could send somebody over to run through the slides in my office someday so that we don't waste the time of the subcommittee if they have seen this.

Has this been presented to the subcommittee before?

General ABRAHAMSON. There have been several levels. Senator Warner and Senator Exon have gone into the classified level in great detail.

I really feel very uncomfortable if either you as members of this very vital committee or other Members of the Congress don't understand that this is a well structured and laid out program and in many cases it goes down to very, very small and very specific technical objectives.

Because we talk about the large issues all too often, you may not understand or you don't have the confidence that we have laid out the program and understand the priorities associated with these various objectives.

That is, of course, something I would like to get across rather than just sitting here——

Senator WARNER. I bear some of the responsibility for not having you at the first hearing. We moved around in reverse and attacked you from the rear before you had a chance to set up your offensive position.

I pledge to you that at the next hearing the Chair will allow you to basically structure and present it as you wish. I will do my very best to see that all our colleagues are apprised of the importance of this hearing and hope that they can attend. I would suggest we start at 8:30 some morning in the hopes we can go at least 2 hours without interruption.

Senator GLENN. Do you plan that in the next week or two?

Senator WARNER. Yes, I would, if that is agreeable with you.

Hopefully, you can accommodate us on that basis?

General ABRAHAMSON. We will respond.

Senator WARNER. This being a Friday, the Senators have heavy commitments elsewhere.

Thank you very much.

[Questions submitted for the hearing record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR JOHN WARNER

COST EFFECTIVENESS OF U.S. STRATEGIC DEFENSES

Senator WARNER. What are the criteria you are using to determine the "cost effectiveness" requirement for U.S. strategic defenses? Is it defined as the cost for the attacker to buy back a re-entry vehicle, or is it the cost of buying back his confidence in his war plans?

General ABRAHAMSON. A major goal of the SDI research program is to bring along technologies so that options based on the architectures designed from this program are affordable. The term affordable is meant to imply that the cost of an option is

attractive for the benefit derived and when compared with other reasonable options. While this research program is nowhere near providing cost information on a deployed defense, some trends in advances in technology encourage us to consider pursuing research into strategic defense.

First, the total cost of performing research and development, and later deployment of offensive missiles is increasing significantly when compared with diminishing incremental benefits in their effectiveness. There is reason to believe that at some point it will be less expensive to build defenses than to regain an offensive advantage and its attendant level of offensive capability by attempting to avoid or overcome these defenses. Therefore, if the SDI research program can produce cost projections that indicate a favorable ratio of cost to the U.S. of building defenses to the cost to the USSR of building offenses and defense suppression, we could conclude there is a favorable benefit to the U.S.

QUESTIONS SUBMITTED BY SENATOR DAN QUAYLE

SDI RESEARCH

Senator QUAYLE. Do you agree with the Nitze speech made several weeks ago that the initial period for SDI in which only research would be done under the limits of the ABM system would last for "at least 10 years" or more? Have you not given any thought to conducting a missile defense program that might deploy technology such as an Anti-Tactical missile system that does not clearly raise question of violating the ABM Treaty? Also, do your plans allow for the contingency of the Soviets breaking out of the ABM Treaty before 1995 or the U.S. deciding to amend the treaty?

General ABRAHAMSON. We agree with Mr. Nitze that "For the immediate future, at least the next 10 years, we will continue to base deterrence on the ultimate threat of nuclear retaliation. We have little choice; today's technology provides no alternative."

The United States is conducting research on a number of technologies relevant to defending against shorter range missiles. However, as with defense against strategic range ballistic missiles, decisions on specific system performance requirements and system design cannot reasonably be made until research on the relevant technologies prove them to be feasible. We expect to reach this decision point in the early 1990s.

The U.S. will not circumvent the ABM Treaty by giving an air defense system or an ATBM system capabilities against strategic ballistic missiles or by testing ATBMs in an ABM mode. The USSR, in contrast, is testing a weapon, the SAX-12, which is both an anti-aircraft and anti-tactical ballistic missile, and may have capabilities against some strategic ballistic missiles as well. The ABM Treaty specifically enjoins the parties from giving "missiles, launchers, or radars, other than ABM interceptor missiles, ABM launchers, or ABM radars, capability to counter strategic ballistic missiles or their elements in flight trajectory."

As to our plans regarding the ABM Treaty, the U.S. reserves the right to respond in appropriate ways to Soviet violations of the ABM Treaty, some of which may eventually bear on the Treaty constraints as they apply to the United States. The United States government must guard against permitting a double standard of compliance, under which the Soviet government would expect to get away with various violations of arms agreements while the U.S. continues to abide with all provisions.

DEFENDING AGAINST TACTICAL BALLISTIC MISSILE ATTACKS

Senator QUAYLE. Both in DOD's explanations of SDI and in its most recent report to Congress concerning nuclear winter, the Secretary of Defense has emphasized the desirability of defending against tactical ballistic missile attacks in Europe by Soviet SS-21s, 22s, 23s, systems the could carry either chemical or conventional warheads in addition to nuclear munitions. Does SDIO share this view? What is SDIO doing to help perfect such a system? Do you consider the development of such a system as having as high a priority as the Secretary has given it?

General ABRAHAMSON. It is highly desirable that we be able to defend against Soviet tactical ballistic missiles aimed at Europe. Our security is inextricably linked to that of Europe and our other Allies. America could not live in a world in which Europe was overrun. For that reason alone, there is not the slightest possibility that Europe can be decoupled from us in pursuit of this initiative. The SDI program will not confine itself to the exploitation of technologies with potential solely against ICBMs and SLBMs. It will also examine carefully the technologies having potential applications against shorter range ballistic missiles because an effective defense

borne out of this research could have a significant impact on deterring aggression in Europe. Therefore, we intend to pursue the goal of enhancing the security of our Allies as well as that of the U.S.

Soviet doctrine stresses the use of conventionally-armed (including chemical warheads) ballistic missiles to initiate rapid and wide-ranging attacks on crucial military targets throughout Europe. They have the shorter range ballistic missiles to strike anywhere in Europe. SDI is considering that threat in its research. It is apparent that by reducing or eliminating the military effectiveness of such ballistic missiles, defensive systems have the potential for enhancing deterrence against not only strategic nuclear war, but against nuclear and conventional attacks on our allies as well. The threat against Europe has always been part of the considerations of this program.

Since the SDI program is still pursuing research, no specific system is as yet envisioned. Therefore, we cannot state that any particular system or systems would apply specifically with a known effectiveness against such missiles. However, over the next several years, we will work closely with our allies to ensure that, in the event of any future decision to deploy defensive systems (a decision in which consultation with our allies will play an important part), allied, as well as U.S., security against aggression would be enhanced.

RESEARCH IN COMPLIANCE WITH ABM TREATY

Senator QUAYLE. On page two of your testimony, you emphasize that SDI research will be done in strict compliance with the ABM Treaty. What sort of restrictions does the Treaty currently impose on research efforts you might otherwise engage in? Could you please detail these for the record? What would it take in the way of Soviet behavior for us to reconsider such self-imposed restrictions?

General ABRAHAMSON. The treaty prohibits developing testing and deploying of ABM components that are space-based, sea-based, air-based, or mobile land-based. It does not prohibit research efforts on technology which may have ABM potential. These are not self imposed. They are part of our obligation under the treaty.

ANTI-TACTICAL BALLISTIC MISSILE SYSTEM

Senator QUAYLE. Are you aware of the Army's efforts to develop an anti-tactical ballistic missile system? Does the Army have a finalized development plan for such a system? [Deleted.] How much is SDIO involved in this effort and is there any reason why the SDIO couldn't devote more of its funds to this effort?

General ABRAHAMSON. Yes we are aware of the Army's effort and there is a program plan for the near term. It is based on upgrading existing systems. Plans for the longer term requirement are only in the formulation phase. The Army hopes to complete these plans in 1986. [Deleted] SDIO is involved but not in a major way. The funding effort seems appropriate.

DEPLOYMENT OF MISSILE DEFENSE SYSTEM

Senator QUAYLE. Are there any scenarios you have imagined under which our deployment of a missile defense system might not only have a favorable cost-benefit exchange ratio but be of such a quality that it would encourage the Soviets to try to defeat the system by going to offensive systems that would have to be so agile in evading the system as to be far less indiscriminately (sic) destructive (large in yield and inaccurate in guidance) than existing offensive missile types?

General ABRAHAMSON. It seems unlikely that the Soviets would select counters to a U.S. strategic defense that would result in significantly greater and less discriminatory destruction. The major obstacle to any counters to an effective defense against ballistic missiles would be whether it was technically feasible or affordable. As the U.S. government has repeatedly emphasized, we would not deploy advanced defenses against ballistic missiles unless they were cost-effective at the margin—that is, that it would be less expensive to deploy additional defenses than to field offensive forces designed to overwhelm those defenses.

DEFENSIVE TECHNOLOGY STUDY

Senator QUAYLE. On page 6 you mention that SDI is being built on "the foundation established by Dr. Fletcher in the Defensive Technology Study." Does that foundation include that study's rather stringent requirement that any system worthy of being deployed must be nearly 90% effective or are you using the more forgiving incremental criteria laid out in the Hoffman Study?

General ABRAHAMSON. "The foundation established by Dr. Fletcher in the Defensive Technology Study" does not include a 90% effectiveness requirement for potential strategic defense systems. Volume 1 of The Defense Technology Plan (page E-1) states that "the ultimate utility, effectiveness, cost, complexity, and degree of technical risk in a system will depend not only on the technology itself, but also on the extent to which the Soviet Union either agrees to mutual defense arrangements and offense limitations or embarks on new strategic directions in response to our initiative."

The "foundation" referred to on page 6 is the technically responsible plan set forth by Dr. Fletcher's team that illuminates the technological alternatives for creating a defense against ballistic missiles. This plan or "foundation" also provides the basis for selecting the technology paths to follow when and if a specific defensive strategy is chosen for implementation.

Senator QUAYLE. Doesn't agreed statement D of the ABM Treaty suggest that space-based ABM systems could be deployed under the terms of the Treaty so long as prior to deployment a good faith effort was made to see if limits on its deployment were desirable by bringing the matter up for consideration before the SCC?

General ABRAHAMSON. No. Agreed statement D refers to Article III which permits the deployment of fixed ground-based ABM components at specified locations. It does not provide for deployment of space-based components otherwise prohibited by Article V of the ABM Treaty.

QUESTION SUBMITTED BY SENATOR PETE WILSON

ANTI-BALLISTIC MISSILE SYSTEM

Senator WILSON. Could you differentiate for this committee a "technology demonstration," a "scientific proof of principle" and the "test of a component of an antiballistic missile system"?

General ABRAHAMSON. Technology demonstration, scientific proof-of-principle, and test of a component are terms in the vernacular of the research and development (R&D) world that are widely used to characterize situations or discrete events in an R&D program.

Scientific proof-of-principle is used to refer to research and develpment efforts that provide the cogent evidence to establish the validity of a postulation of a scientific theory or physical principle. Such activities are usually conducted in the research and/or exploratory development phases.

A technology demonstration refers to an effort designed to provide conclusive evidence that a research project for a specific technology has met its goals. It could involve a wide range of activities from tests on the constituent parts, to tests of various assemblies of the constituent part, to demonstration of the technology in the context of the system for which it is designed.

A test of a component can be one of any number of individual performance checks, reliability demonstrations, measurements, etc. made on a component. In the nominal progression of the hierarchy of assembly, components (resistors, capacitors, etc.) make up subsystems (receiver, transmitter, etc.) which in turn are assembled into systems (communications system).

Within the context of the ABM Treaty, a component is one of three things—the launcher, the interceptor missile, or the radar of an antiballistic missile defense. Thus, the test of a component of an antiballistic missile system is the test of a launcher, an interceptor missile or a radar. Further, in context of the ABM Treaty a technology demonstration involving the test of a technology or technologies in a system context might be considered a "test of an ABM component" while other technology demonstrations of constituent parts and subsystems would not. Scientific proof-of-principle experiments are nominally not system-level tests and therefore not tests of "components."

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN

FUNDING FOR SDI BUDGET

Senator LEVIN. How much funding is provided in the SDI budget, or anywhere else in the Defense Department budget for research, development and deployment of countermeasures to a Soviet SDI/BMD program? Please identify by program element, funding profile for 1986–1990, and provide a brief description of the objectives of each program element.

General ABRAHAMSON. The United States has programs underway or planned which could mitigate but will not eliminate the impact of potential Soviet ABM defenses. In general, the projected operational dates of our responses are later than the earliest possible date for Soviet breakout. The potential responses to the threats in the three periods are as follows:

Near-Term (before 1986).—In the period before a breakout could occur, the Soviet ABM capability is sufficiently limited that no further United States response is considered necessary in view of the large number of ballistic missile warheads currently available in the United States inventory and the fact that Minuteman carries chaff which could be effective against the present Moscow defense.

Mid-Term (1987–1990).—The illegal radar at Krasnoyarsk when operated with its network of sister radars around the periphery of the U.S.S.R. will make it much more costly to neutralize the ABM potential [deleted]. A temporary recourse in the mid-term (Soviet autonomous defense capabilities could negate it in the early 1990's) is to use large numbers of warheads to overwhelm the defenses which we must expect the Soviets would use to protect these radars. [Deleted.]

Far-Term (after 1990).—Penaids developments which could lead to deployments in this time period include: lightweight radar chaff, passive and active decoys, and a prototype deployment system which would permit Peacekeeper and Minuteman to carry these penaids. The exact dates are classified.

For both ICBM's and SLBM's the best response to an upgrade of the ABM is a [deleted]. If the Soviet defenses include an [deleted]. The Navy plans to continue work leading to [deleted] for the Trident II (D–5) missile. The Air Force currently has [deleted] in 1986 which could be used with both the Navy and Air Force [deleted].

The objective of the program is to reduce the lead time gap such that a penaids response to a Soviet ABM breakout could begin to be deployed [deleted]. It should be noted in this connection that the Soviet's nationwide ABM radar base has [deleted]. For the next [deleted].

Our current penetration aids program is focused on providing options to counter defenses of the type currently under test or deployment in the U.S.S.R. rather than the types envisioned by the SDI program. Therefore, it is important that the United States proceed with the programs outlined above. However, it must be recognized that in the far-term even the best penetration aids which we can devise will mitigate but [deleted]. There will be significant uncertainties about the effectiveness of decoys in the face of advanced discrimination capabilities anticipated in the early 1990's because we will probably be unable to determine the inner working of Soviet electronic subsystems. MaRV would provide high confidence, but even MaRV, by the late 1990's could suffer degradation in retaliatory effectiveness if the Soviet develop and deploy advanced mobile defenses well stocked with interceptors. In the very far-term (c.2000), there will be increasingly significant concerns regarding the viability of penetration aids of all types if the Soviets successfully develop and deploy the defense technologies we see them working on today. Hence, at this time we believe our most important response for the longer term is to prepare for a transition from exclusive reliance on offensive forces to increasing reliance on strategic defense. Even in this context, continued search for new penetration technologies is necessary to understand their impact on the viability of both offense and defense, to provide a baseline which must be taken into account in the design of the defense, and to ensure that we and the Soviets face analogous defensive problems.

PENETRATION AIDS FUNDING

	PE No.	1986	1987
Title:			
AF/ASMS	6311F	161	182
AF/MM-III	11213F		38
Navy D–5	64363N	15	2
Total		176	222

CONTRACTS FUNDING SDI ACTIVITIES

Senator LEVIN. Please list all contracts awarded from fiscal year 1984 and fiscal year 1985 funding for SDI activities, the type of contract in each case (firm fixed price, fixed price incentive, cost plus, etc.), whether each contract was awarded under competitive conditions (including negotiated competition, competitive publication, etc.) or sole source?

General ABRAHAMSON. See attached listing. This is the current information that is presently available. We are in the process of establishing an automated system which will make this information more comprehensive. [Listing retained in committee files.]

SDI FUNDS OBLIGATED

Senator LEVIN. Your statement says that much of the previously-approved SDI funds have been already obligated. Please provide details as to how much (percent and $) of the fiscal year 1984 and fiscal year 1985 funding has been obligated? Expended? Please provide a timetable for the obligation and expenditure of the remaining funds (percent, $, dates)?

General ABRAHAMSON. As of the latest accounting records (March, 1985) the SDI Research Program has obligated and expended as follows for fiscal year 1985: ($ in millions)

[Dollar amounts in millions]

	Obligations			Expenditures		
	Cumulative planned	Cumulative actual	[percent]	Cumulative planned	Cumulative actual	[percent]
Month:						
1984 October	$110,086	$118,256	8	$1,500	$54	
November	271,625	283,802	20	4,350	2,806	0.2
December	460,319	515,953	37	10,500	10,641	.7
1985 January	588,597	570,809	41	20,150	20,260	1.4
February	724,972	692,153	50	80,500	85,472	6.1
March	846,301	783,578	56	107,000	121,698	8.7
April	946,899			200,000		
May	1,045,912			310,000		
June	1,161,743			400,000		
July	1,255,773			475,000		
August	1,344,147			580,000		
September	1,383,326			699,000		
October	1,391,223			795,000		
November	1,395,699			870,000		
December	1,397,000			963,000		

In reference to fiscal year 1984 data only the Army is able to accurately separate the fiscal year 1984 SDI related obligation and expenditure data within the accounting systems. The current fiscal year 1984 data for the Army [BMD] is:

Program, 614,959; obligations, 604,464 (98 percent); expenditures, 504,678 (82 percent).

Senator LEVIN. For those funds already obligated/expended and those awaiting obligation/expenditure, provide a description of which areas of the SDI program are concentrated in which categories, according to at least the five major program areas?

General ABRAHAMSON. The following table displays the breakout of fiscal year 1985 obligations by the five major program areas: As of the end of March 1985.

	Annual program	Obligations			Expenditures	
		Actual	[percent]	Unobligated	Actual	[percent]
63220C	$545,950	$369,698	68	$176,252	$31,672	6
63221C	376,400	213,360	57	163,039	10,031	3
63222C	255,950	112,024	44	143,926	12,057	5
63223C	99,000	27,752	28	71,248	233	
63224C	112,000	59,198	53	52,802	1,316	1
65898C	8,000	1,546	19	6,454	575	7
Undistributed					65,814	
Total	1,397,300	783,578		613,721	121,698	

Senator LEVIN. For those funds awaiting obligation, provide a breakdown, by expected contract type and under what conditions (competitive or non-competitive) each is expected to be awarded.

General ABRAHAMSON. Based on fiscal year 1985 historical experience for SDI contractual efforts we project:

Percent competitive: Air Force, 94; Navy, 89; Army, 64.

[Whereupon, at 11:02 a.m., the subcommittee adjourned, subject to the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1986

MONDAY, MARCH 18, 1985

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

STRATEGIC DEFENSE INITIATIVE

The subcommittee met in open session, pursuant to notice, at 9:14 a.m., in room SR-222, Russell Senate Office Building, Senator John W. Warner (chairman) presiding.

Present: Senators Warner, Thurmond, Cohen, Nunn, Hart, Exon, Levin, and Glenn.

Staff present: Arnold L. Punaro, staff director for the minority; Robert G. Bell, Robert F. Bott, Douglas R. Graham, and William E. Hoehn, Jr., professional staff members; and Karen A. Love, staff assistant.

Also present: Romie L. Brownlee, assistant to Senator Warner; James M. Bodner, assistant to Senator Cohen; Mark J. Albrecht, assistant to Senator Wilson, Allan Cameron, assistant to Senator Denton; Janne E. Nolan, assistant to Senator Hart; and Peter D. Lennon, assistant to Senator Levin.

OPENING STATEMENT BY SENATOR JOHN W. WARNER, CHAIRMAN

Senator WARNER. The subcommittee convenes in open session this morning to continue to receive testimony on the President's Strategic Defense Initiative in review of the fiscal year 1986 Department of Defense authorization request.

This marks the fourth in a series of hearings on this important subject, which has included testimony from both administration officials and public witnesses.

The subcommittee will conduct one final hearing with public witnesses tomorrow.

In addition, we will be scheduling a hearing in closed session to receive sensitive intelligence information regarding the disturbing Soviet activities in this area that include violations of the 1972 ABM Treaty.

Our witnesses this morning are Dr. Albert Carnesale, professor of public policy and academic dean at Harvard University's John F. Kennedy School of Government; and Dr. Ashton Carter, assist-

ant professor of public policy from the same distinguished institution.

After we hear from this panel of witnesses, we will go into closed session to review the details of the administration's request for fiscal year 1986 with Gen. James Abrahamson, U.S. Air Force, the director of the Strategic Defense Initiative Organization.

General Abrahamson has kindly agreed to appear before us again this morning to complete the business we started on Friday.

On behalf of the subcommittee, I would like to welcome our first panel of witnesses this morning.

Senator Hart, after you have made your opening comments, we can proceed with the testimony of our witnesses.

Senator HART. I join the subcommittee chairman in welcoming these witnesses and look forward to their testimony.

Senator WARNER. Dr. Carnesale, would you like to lead off?

STATEMENT OF DR. ALBERT CARNESALE, PROFESSOR OF PUBLIC POLICY, ACADEMIC DEAN, JOHN F. KENNEDY SCHOOL OF GOVERNMENT, HARVARD UNIVERSITY

Dr. CARNESALE. Thank you, Mr. Chairman.

I should like to raise a number of questions related to the Strategic Defense Initiative that have to be addressed as we move forward, and then address what I consider to be the important issues.

The broad range of questions starts with: What is the SDI?

Second, what are its objectives?

Third, will it work?

Fourth, what will it cost?

Fifth, what will the Soviets do?

Sixth, what about our allies?

Seventh, what will be the effect on arms control?

Eighth, what does it have to do with the risk of nuclear war?

Ninth, what does ethics have to do with all of this?

And tenth, what would you do?

I will spend more time on some of these than on others.

SDI

First, what is the Strategic Defense Initiative? One would expect to find guidance in the President's speech of March 23, 1983—nearly 2 years ago—in which he questioned deterrence by threat of offensive retaliation.

He asked if it would not be better to save lives than avenge them. With this, everybody can easily agree.

Second, he asked the rhetorical technical question: What if we could intercept and destroy strategic missiles before they reached our own soil or that of our allies? Everybody would agree that it would be nice if we could do it.

Then he set forth a long-term research and development program to begin to achieve our ultimate goal of eliminating the threat posed by strategic nuclear missiles. It sounds like a worthwhile goal.

Finally, he envisioned rendering nuclear weapons on both sides impotent and obsolete. Virtually nothing in the President's speech, it seems to me, is really at issue in the debate over the SDI.

If you asked the American public, or any Member of the Senate, or any member of the defense community, or any member of the peace community or a public interest group, "Would you rather be vulnerable or invulnerable?," they would pick invulnerable.

So, that is not where the debate is.

WILL SDI WORK

The next questions are what will it cost and will it really work? It is important that we realize that the Strategic Defense Initiative deals only with defense against ballistic missiles. It does not deal with cruise missiles, or long-range bombers, or fishing trawlers, or torpedoes, or the myriad other ways in which the Soviets could deliver nuclear weapons to our cities.

Anybody who claims he or she is convinced that the Soviets do not now have two nuclear weapons in warehouses in each of our 150 larger cities should never question our ability to verify the most far reaching arms control agreement one could think of.

Certainly two Poseidon size reentry vehicles, which could fit in your Toyota trunk, could be smuggled into each of our cities. At worst, you could put a bomb in a bale of marijuana, which we seem unable to keep out of our cities.

So, the notion that the SDI is related to making ourselves invulnerable is wrong. That is not what the debate should be about.

The invulnerability of our cities requires defense against everything. We have no reason to believe we can achieve that. The Strategic Defense Initiative, even if successful, will not accomplish that feat. Then what is the Strategic Defense Initiative for? Several answers have been offerred.

According to everything the President has said, and I believe it has all been consistent, the objective is eventually to transcend deterrence by threat of retaliation. We are to get rid of the sword of Damocles over our heads and those of the Soviets and ultimately to have a defense that is "thoroughly reliable and total," to use the words of Secretary of Defense Weinberger.

Others in the administration, and some supporters of the administration, have used more traditional military objectives to describe what the SDI is for.

For example, they talk about using it to bolster deterrence by defending our retaliatory forces. Their objective is to increase confidence that we could retaliate with our offensive forces, not to eliminate retaliation by offensive forces.

They also list the traditional military goal of limiting damage to our Nation, particularly against small attacks by either the Soviets or some nth country or terrorist—providing the nth country or terrorist is kind enough to attack with ballistic missiles, which would be the only system against which we would have a defense.

Another traditional military reason is to hedge against a Soviet breakthrough in BMD reasearch and development.

The final objective is to affect Soviet behavior, especially to discourage further Soviet deployment of ballistic missile defenses and to encourage the Soviets to reduce their offensive forces.

To meet all of these objectives is a very tall order, but an impermeable shield would do it. If we could build the proverbial astro-

dome over the United States, we could do all of these things. Less than perfect defenses could not do them all. Our cities would remain vulnerable and mutually assured destruction would remain the situation.

The purpose of BMD appears to me very much in the eye of the beholder. If the Soviet Union deployed a widespread ballistic missile defense, there would be no doubt in our minds that it was part of a first strike strategy, and that its purpose was to blunt our retaliatory blow.

If, on the other hand, we were to deploy a widespread ballistic missile defense, we would know that it was for the purpose of trying to deter a Soviet first strike by frustrating their ability to achieve their objectives, or at least to complicate their attack.

So, it is not suprising that they might perceive our ballistic missile defense as part of a first strike strategy, just as we would see theirs the same way.

One of the first things to be done is to decide what the SDI is for. It is hard to imagine a strategy which would transcend deterrence by threat of retaliation and, at the same time, bolster deterrence by threat of retaliation.

Would ABM work? Obviously, that depends on the purpose. What targets are to be defended? How well do they have to be defended? What is the level of protection required? What kinds of technologies will be available?

The answer is we don't know. The perfect defense, I believe, is extremely unlikely. Dr. Carter, I am sure, will speak to that as well.

Let me put it this way. Suppose we were going to form two teams, team A and team B. The job of team A is to come up with a defense that can guarantee that team B cannot explode a large number of nuclear weapons on team A's territory. The job of team B is to explode a large number of nuclear weapons on team A's territory. Team B gets to decide when the war starts. Which team would you rather be on?

I know of very, very, few scientists or engineers who would not choose to be on team B rather than on team A. When the question is framed in terms of the Americans versus the Soviets, it is not surprising that a large number of Americans choose to bet on the American team. But if you just make it team A versus team B, I think they would bet on team B.

As for the more modest goals, such as protecting ICBMs, or complicating a Soviet attack, or defending against small attacks, these are technically feasible. The question is whether they can be done at reasonable cost. One must know whether the adversary could simply build up his offense more readily than we could expand the defense.

Against terrorists and madmen, BMD is feasible but irrelevant. Qaddafi will have nuclear weapons long before he has ballistic missiles, and it is unlikely that he would be so cooperative as to deliver his nuclear weapon by the one system against which we might have a defense.

COST OF SDI

How much would the SDI cost?

The answer to that is simple. No one knows. What we are debating now is the cost of the research program for which, as you well know, $26 billion over 5 years has been requested.

That is a lot of money. The request for fiscal 1989 is $7.4 billion, which is about 15 percent of the Defense Department's total RDT&E budget, and close to 50 percent of its research budget.

So, in terms of opportunity cost, this is a big, big program. But the $26 billion does not cover deployment. When you press people on that cost, they give you a guess, such as $500 million or $1 trillion. And that is just for the defense against ballistic missiles.

We just don't know what the full cost would be. Even though we have no idea, the left says it is too much and the right says whatever it is, it is worth it.

What would the Soviets do?

SOVIET BMD PROGRAM

The most important thing to keep in mind here is that the Soviets already have a very active ballistic missile defense program. I know you are all aware of that, so I won't go into detail.

Whether one focuses on the Moscow ABM system, or antitactical ballistic missile systems, or the Krasnoyarsk radar, or research and development on advanced technologies, it is clear that the Soviets have a great deal going on. They have extensive air defense, and civil defense as well. One would expect there would be some Soviet response to an American ballistic missile defense, not just the rhetorical response which we are already seeing, but some tangible actions as well.

The first thing they would do is to be sure they could penetrate our defense. They might deploy penetration aids, more warheads on their missiles, more missiles, and maneuvering reentry vehicles—all the traditional kinds of countermeasures, plus some new ones. You would expect to see more cruise missiles, both submarine launched and air launched. You would also expect to see more Soviet ballistic missile defense. This last piece, unfortunately, is left out of most analyses.

Too often the question takes this form: Suppose the world stays the same except for one change, the United States adds ballistic missile defense, is that good? Since most analyses don't take into account the cost of the ballistic missile defense, the answer is clearly and unambiguously yes.

If there is no connection between what we do and what the Soviets do, we are better off having more—more defense, more offense, more everything, especially if it is free. But it is not free. More importantly, I believe the Soviets will react, and not only with countermeasures, but also with defenses.

ABM TREATY

The ABM Treaty creates an unusual situation. While the treaty permits some activities in the BMD field, it pretty much stymies

anything major. If we remove that impediment, one would expect the Soviets to do a great deal more than they are doing now.

If we were to deploy ballistic missile defense to enhance the survivability, for example, of our ICBM's, and if the Soviets were to respond by deploying their own wide-scale ballistic missile defense, then their reaction would impede the penetrability not only of our surviving ICBM's but also of our submarine-launched missiles and, to some extent, our cruise missiles.

This tradeoff between increased survivability of our retaliatory force and decreased penetrability is an important consideration that often gets left out of the analysis. Analysts tend to look at Soviet responses in terms of offensive measures and to forget about increases in Soviet defenses.

The Soviets cannot wait until our defenses are deployed before they make the decision whether to deploy wide-scale defenses themselves. They, too, have to look at the lead times. Here is an issue over which the left and the right, if I can use those simple terms to categorize groups, are most extreme.

The left seems to adopt an absolute action-reaction model, the poor Soviets will only respond to what the United States does. The right on this issue seems to assume that Soviet behavior is completely uncoupled from American behavior, that whatever we do in ballistic missile defense will not affect what the Soviets do in ballistic missile defense.

The next question is how would our allies react? We have only preliminary reactions now. The public reactions of allied leaders are very moderately favorable. They sound like, "Who can be opposed to research?" It is rather difficult for an allied leader to take a negative stance on the SDI.

First of all, it is the President's initiative. It is his baby. That makes it hard to oppose.

Second, the leaders would be in a position of telling the American people they should not try to defend themselves. That does not sound like a good political move.

Third, it is likely that we Americans will go forward with the SDI anyway. It might involve high technology and a lot of dollars, and they don't want to get left out of either.

When you talk to them privately, they have a hundred reasons why they don't like it. Now, 95 of the 100 reasons are variations on one theme: the SDI would change the status quo. Europeans don't like to change the status quo. If you want to take nuclear weapons out of Europe, the Europeans don't want that. If you want to put them in Europe, they don't like that. If you want to put troops in, they don't like that. If you want to take troops out, they don't like that either.

There has not been a conventional or nuclear war in Europe in 40 years, and they want to keep it that way. This explains most of their initial opposition. It is not based on analysis.

Some of the response is a bit more analytical. The French and British worry that if the United States has defenses, so will the Soviets. What happens to their deterrent forces? U.S. missiles may be able to penetrate, but what happens to theirs? They can't spend what we can spend. That is the 96th reason.

The 97th reason is that if the Soviets have antiballistic missiles, it might lead them to be more adventurous in foreign policy. It might lead to war.

The 98th reason is that if the United States has antiballistic missiles, its foreign policy might lead to war.

The 99th reason is if both superpowers have BMD, there may be trouble.

The 100th reason is heard in the defense establishment. Where are the dollars for SDI going to come from? The Europeans worry that the funds might come from tanks, rifles and ammunition. That is their set of worries.

As I said, the European reactions have been preliminary and mildly negative. They are not crazy about this idea, and they are afraid it will get out of hand.

The left says that the allies oppose the Strategic Defense Initiative, and that they are right to do so.

The right says that the allies should favor the SDI and that eventually they will.

SDI EFFECT ON ARMS CONTROL

How will the SDI affect arms control?

First is the matter of the ABM Treaty. I am not an unbiased observer, since I was on the team that negotiated the ABM Treaty. But the SDI and the treaty are clearly on a collision course.

The administration says we are not going to violate the treaty for the next 4 years. But during that time, we will get ourselves up to the edge, and we'll arrive with $26 billion of financial momentum, with a Presidential initiative worth a political momentum, and with a lot of promises. It would be very difficult to say: "We took a good look but didn't find anything," or "Sorry, it was a good idea, but it was not there."

I find it hard to imagine that we could resist taking the next step. If we do that, remember the cost is losing any control we might have over Soviet antiballistic missile defense. The trade might be worth it. It might not.

As for reductions in offensive arms, I cannot understand the argument that maintains that the possibility of U.S. defenses will make the Soviets more interested in reducing their offensive weapons. That certainly would not be our response. It has not been the response of any military person I have ever talked to.

That might be a plausible Soviet response only if you believe that our defenses will be near perfect, so that offensive forces would be useless. I don't know anybody who really believes that. It is not impossible for that to happen, but I can't imagine it.

As far as antisatellite or ASAT arms control is concerned, I note that, by and large, the ASAT task is easier than the ballistic missile defense task. Thus, you cannot have ballistic missile defense running free and expect to have any constraints on anti-satellite systems.

TECHNOLOGY SHARING

Let me speak about technology sharing. Any engineer will tell you that to penetrate the other side's defense, nothing would help you more than knowing the technology of the defensive system.

We all remember the debates during the election campaign. Mr. Mondale said that SDI technology won't work and is too important to share with the Soviets. President Reagan said this technology will work and we should share it with the Soviets. My compromise is clear. If it works, don't share it; if it doesn't work, share it.

How would BMD affect the risks of nuclear war? This is probably the hardest question.

If one had perfect defense or near perfect, it certainly would reduce markedly the consequences of a nuclear war if it should occur. So long as our cities remain vulnerable, and there is nothing that we see that is going to change that, BMD would not change the consequences very much.

What does it do to the likelihood?

Suppose we were able to defend some of our retaliatory forces, and suppose we were able to complicate the other side's attack. Well, we have been through that debate before. That is what the Safeguard debate was about. It must now be updated. There are new technologies, and the world situation has changed, but there remain questions about whether defense enhances or undermines crisis stability, and whether or not it leads to an offensive-defensive arms race.

Those are questions we have dealt with before. We should deal with them again, but they have nothing to do with rendering our Nation invulnerable.

Many believe that the SDI will increase the risk of nuclear war and many believe it will reduce it.

On the ethical considerations, just a word. As I said earlier, we prefer an invulnerable America to a vulnerable one. That is not the issue.

It is not mutually assured destruction against mutually assured survival. Mutually assured destruction is a situation; it is not an objective. It is not a strategy. It has never been our strategy. It is not our targeting doctrine. It is not the way we have ever targeted our weapons. It is not the way we target them now. It is not the way we will target them in the future.

The reason we remain vulnerable is not because we believe it is good. It is because we didn't know how to avoid it. There was a time when we considered deploying ballistic missile defense. We felt it would not make our Nation invulnerable against the Soviet threat, which then did not approach what it is now, and we thought we would be better off if both sides didn't try to have ballistic missile defenses and if both sides remained vulnerable.

Mutually assured destruction has never been our idea, our objective or our strategy. The fact that both the left and right attack it is interesting, but I am not quite sure what it is they are attacking.

As to mutually assured survival, that is a noble objective, but it certainly is not now the situation and it is unlikely in the foreseeable future to be the situation. So, in this comparison of the MAD

situation with mutually assured survival, a noble objective, it is easy to say where people will come out.

Nobody likes the current situation. We all would prefer mutually assured survival if we thought it were achievable. But far less than perfect defenses which defend military forces would push us further in the direction of MAD, because then the targets of choice would be cities. There is nothing else we could destroy with confidence.

From an ethical point of view, the left looks at SDI as a destraction; the right looks at SDI as a moral imperative.

Now for my own short version of what should be done. First, this debate is too polarized to be useful. It leaves out the middle ground, which is where the truth is. As a start, we have to figure out is what we are trying to do with SDI. Are we trying to enhance deterrence or transcend it? It is hard to imagine how to do both simultaneously.

Second, as I indicated earlier, we should control the political and financial momentum. I would not spend $26 billion over 5 years. I believe that would create political momentum such that we would be forced to do something at the end of 5 years, even if there was nothing sensible to do.

I pick a number much closer to $12 to $15 billion. I think that is sufficient to hedge against Soviet breakthroughs in BMD and to keep the Soviets interested in the ABM Treaty. We could spend that money wisely and prudently just in case something exciting is to be found.

Third, I believe the constraints on Soviet ballistic missiles defense are very much in our interest. The Soviets do have a system they could deploy in a relatively short time, perhaps 2, 3, or 4 years. We have nothing like that. We are using the usual American approach of having an even better idea, and never bringing anything to field test.

If the ABM Treaty were terminated today, the Soviets could deploy ABM systems of some significance within 5 years.

The United States would have nothing, absolutely nothing. We should not get the Soviets interested in that. We should reaffirm the ABM Treaty.

Fourth, we should prepare to counter Soviet antiballistic missile defenses. They might decide to terminate the treaty. The Soviet systems need not be effective, but they would be effective if we hadn't done anything to penetrate. So, we should be developing and producing, if not deploying, some penetration aids now.

Finally, perhaps most important, I would fortify deterrence. One thing the left and right seem to agree on is that deterrence by threat of offensive retaliation is immoral, unsound, and unacceptable.

The left's solution is to make nuclear weapons disappear through disarmament, to make them go away.

The right's no less magical solution is to render nuclear weapons impotent and obsolete, to neutralize them.

Neither group offers a realistic solution to our problems. For decades to come we will have to rely on deterrence. It is a rather fragile shield. Its greatest vulnerability is the credibility of our deterrent threat, not our capability.

What do we do when we bad-mouth deterrence?

We undermine that very credibility which is already the weak link. We should be fortifying deterrence in words as well as in deeds.

Thank you, Mr. Chairman.

Senator WARNER. Thank you very much.

Gentlemen, my suggestion is that since we have at the hearing two distinguished people from the John F. Kennedy School at Harvard this morning, that we have a little give and take here, 5 minutes each, and then turn to our next witness. This will also provide the second witness with an area in which we share some concerns.

If that is agreeable, I will lead off for 5 minutes.

First, Dr. Carnesale, without being presumptuous, might I suggest when you say SDI is a Reagan baby, he may have named the baby, but the baby was well along in a number of laboratories and research institutions across the country, long before his March 1983 speech. Indeed, he made the decision to bring the various disparate portions of the research together under an umbrella and fund it.

Now, your emphasis on the ABM Treaty, I think almost all of us, as far as I know, share the thought that the ABM Treaty should remain in place, but you fail to mention any of what we feel are fairly obvious questions about violations of that agreement by the Soviet Union—principally that large radar system.

Would you care to address that issue?

Dr. CARNESALE. I believe I did mention Krasnoyarsk. I will be glad to address both of your points.

First, about the SDI being President Reagan's baby, let me say this. Research was going on roughly at the billion-dollar-a-year level through the Carter years and into the Reagan years. We have been doing research on ballistic missile defense since well before the ABM Treaty, although the amount declined for a while. But we are now talking about an increase over 5 years from the current $1.4 billion a year to $7.4 billion a year. The difference between $7.4 billion a year and $1.4 billion a year corresponds to a rather significant personal initiative on the part of the President.

Senator WARNER. You say $7.4 billion?

Dr. CARNESALE. That is what it would be in 1989, at the end of the 5-year initiative. That is the Department of Defense projected budget. It does not include the Department of Energy piece.

Second, Krasnoyarsk. Suppose you asked an objective observer, a man from Mars, to take a look at what we know about the radar at Krasnoyarsk, and asked him what he thought it was.

I believe his answer would be, "Well, I am not sure."

"Then give me your best guess."

He would say, "I think it is an early warning radar."

If you then said, "Let me tell you about this treaty. It prescribes that an early warning radar has to be on the periphery of the country and looking outward. This one is 500 miles inland. What does it look like now?"

"You asked me for my best guess," the Martian would say. "To me, it looks like an early warning radar. It looks like a duck and walks like a duck. So, my conclusion would be that it is a duck."

What is the Soviet response to this?

The Soviets tell us to wait until they turn the radar on. Then, they maintain, we will see that it is a space tracking radar. Even though it looks like a duck and walks like a duck, when they turn it on we will see that it barks—it doesn't quack. I don't think that this is reasonable.

I think an objective observer looking at that data would conclude that this radar is in violation of the treaty. Unless further information is provided that would convince me otherwise, I would operate on the basis that that radar is in violation of the ABM Treaty.

Senator WARNER. How would you propose to resolve that violation?

Dr. CARNESALE. That is always the most difficult aspect. The main thing I would try to do is get more information.

Let me point out one argument that should not be used. I think that is the most dangerous and counterproductive argument I have heard. I heard it for the first time at a breakfast on Capitol Hill about 3 weeks ago—at which some of you were in attendance—and I heard it in Moscow a week later.

The argument is that the radar is not a violation because the treaty limitation is on radars with a power-aperture product greater than 3 million watt-meters-squared. Since the radar is not yet turned on, its power is zero and, therefore, it is not a violation yet, even if it would be a violation when it gets turned on.

That argument is a disaster. The purpose of limitations on radars in the treaty is to maintain a long lead time for ABM radars.

Anybody who has seen the sketches of Krasnoyarsk knows it is large. To say it is only a violation when you turn it on reduces the lead time to zero. That would mean that the Soviets could build radars like that all over the Soviet Union; as long as they didn't turn them on, they would not be in violation. That is absurd.

It is not what the negotiators had in mind. It was not what was presented to the Congress at the time. It is not what the Soviets believe, though we might talk them into it if we work on that hard enough.

If they try to tell us it is a space track radar, I would say convince me. I would tell the Soviets that we cannot maintain public support for this treaty unless we get further data consistent with the idea that that radar is a space track radar as opposed to an early warning radar.

Senator WARNER. Senator Hart?

Senator HART. Thank you, Mr. Chairman.

Dr. Carnesale, I assume you are familiar with Dr. Carter's study and DOD's response to that study.

Do you have any comments on it other than those you have already put before the subcommittee, regarding its technical aspects?

Dr. CARNESALE. While my doctorate degree is in nuclear engineering, I have been a professor of public policy for a long time, so I am not currently an expert on some of the strictly technical aspects.

After reading the report, the DOD criticisms, and the response from a distinguished panel of three scientists, I conclude that any questions about the conclusions of Dr. Carter's report have been put to bed. The most significant conclusion, from a policy point of

view, is that a perfect to near perfect defense is so remote that it should not serve as the basis for public expectation or public policy. That is not a precise quote, but it is close enough.

Everything that I have seen is consistent with that finding. I have seen nothing that undermines the merits of the basic analysis or the basic conclusion.

Senator HART. Aside from a fairly dramatic increase in research funds in the President's proposal and some rhetoric which did elevate public expectations about a new technological breakthrough, and therefore, a departure from 40 years of what has been described as mutual terror, what really has changed?

In other words, how is the world different today than it was on March 1, 1983, a week or two before the President gave his speech?

Dr. CARNESALE. It has not changed at all physically. That is one of the reasons why I believe that something can be done in the field of arms control with the Strategic Defense Initiative.

Let me mention a positive effect on arms control. The SDI certainly has gotten the Soviets' attention. It is certainly something about which they are concerned. They also realize that what has happened is essentially political and that is all.

So that if some sort of brake is to be put on it, all that is required is some political brake. There is nothing irreversible technologically. We have not conducted any test that is not permitted under the treaty.

The major thing that has changed, in direct response to your question, is the political momentum. It has been increased markedly. Soviet expectations about U.S. adherence to the ABM Treaty beyond 5 years from now have diminished markedly.

Certainly my expectations of that adherence have been diminished markedly, as have the expectations of most Americans. I find it hard to imagine that if the SDI goes forward as proposed by the President, the United States will still be adhering to the ABM Treaty 6 years from now.

I find it hard also for the Soviets to believe. Unless we reverse that expectation, the Soviets now have to set in motion a set of programs based on their changed expectation; from one based on the expectation that the ABM Treaty will be around, to one where the expectation is that it will not.

Senator WARNER. Senator Cohen?

Senator COHEN. Thank you, Mr. Chairman.

SOVIET RADAR STATION AT KRASNOYARSK

Assuming the Soviets refuse to give further information on the Krasnoyarsk radar station; what are our options?

They say they are not going to give us any additional information . What do we do?

It seems you have suggested two options.

No. 1, we could build more penetration aids.

No. 2, we could continue and accelerate our research on BMD.

What are the options available?

Dr. CARNESALE. I would build more penetration aids independent of what they tell us about Krasnoyarsk. That is because I am concerned to some extent about the breakout problem.

Krasnoyarsk is one very large target. It is hard to imagine that it would survive attack by two missiles from one Poseidon submarine.

So, it is not that it is a terrible military threat in and of itself. What is most disturbing about it is that it looks like a violation. We cannot for long maintain public support for an agreement which the Soviets appear to be violating.

If they are not willing to provide further information, there are several options.

One is to conclude that arms control agreements with them just don't work. We are a democracy. Our people have to believe that the other side is adhering to an agreement. It is not just a matter of cost-benefit analysis.

The example I offer you: Suppose you own a small business. You have an accountant working for you. He makes $50,000 a year. To get another accountant as good as he would cost you $75,000 a year. You just found out he is embezzling $10,000 a year. What do you do?

The answer is that you fire him. You don't say, well, I am making $15,000 off of him.

Senator COHEN. Is it your opinion as a student of public policy that if it was satisfactorily established the Soviets were in violation of the ABM Treaty, then public opinion would be to call off treaty negotiations with the Soviet Union?

Dr. CARNESALE. If we could get uniform agreement that they were in violation, and if the Soviets were doing nothing to disprove that notion, I think we could get public support for ending negotiations.

Now, I am not offering that as my preferred alternative because I think that would be a shame. I think we would be cutting off our nose to spite our face. There are other possibilities.

We could build a radar like theirs. If they can build one like that, we can build one like that.

Senator COHEN. We are not going to build one like that.

Dr. CARNESALE. We call it Pave Paws, according to them. The Soviets maintain that we already have one.

I am not satisfied there is any solution other than their providing more data that could hold up over the long term. I think they can understand that. As secretive as they are, they do worry about public opinion, ours.

Senator COHEN. You were in Moscow. What do you think the Soviets mean when they say that they are prepared for a radical solution?

Dr. CARNESALE. Being in Moscow doesn't help. I have no idea what they mean by being prepared for a radical solution. I suspect what they mean is that if the United States will drop the SDI they are prepared to talk about symmetric deep cuts on both sides.

Senator COHEN. Thank you.

Senator WARNER. Senator Nunn?

Senator NUNN. I pass, Mr. Chairman.

Senator WARNER. Senator Levin?

Senator LEVIN. Thank you, Mr. Chairman.

Doctor, when I confronted their chief of staff here a couple weeks ago and asked him, you just tell me in plain, simple Russian or

English how that is not a violation of the ABM Treaty, he reached into his vest and pulled out his map of our Pave Paws treaty.

He had a map in his pocket. "Here are yours, two of them, one in Florida and one somewhere else, the lines going all the way up to the State of Washington and up to Maine. It is the same thing you are doing, no difference."

Anyhow, so Pave Paws is part of the answer. I don't think you have a very good answer to Krasnoyarsk, I have to agree with you. I want to press you on what our response is.

Is it such a military threat to us either in and of itself or potentially connected to other radars that we should abrogate the ABM Treaty?

I think that is the critical issue.

Dr. CARNESALE. I do not believe it is a significant military threat to us. I don't believe any one installation like that, particularly one of a defensive nature, can be a significant military threat.

If we have 20 reentry vehicles targeted on it, we are going to get it. Nobody is going to postulate a defense system that will be so effective in the near term that it could stop all 20 reentry vehicles. I don't think that is the issue here.

I understand there are people talking about the battle management capability of this radar. I don't believe that is significant. What is significant is that it looks like a blatant violation of the treaty.

Senator LEVIN. Why isn't the answer to abrogate the treaty?

Dr. CARNESALE. The reason is I feel that is very much contrary to our interest. If we terminate the treaty today to allow both sides to do whatever they want in the ABM field, the Soviets have things to do; we don't.

Senator LEVIN. The person arguing for the ABM will say they are doing it. They are building the Krasnoyarsk. They would buy your hypothesis, it seems.

Dr. CARNESALE. I say the Soviets are not doing all they want to do. The estimate in 1972 (when we signed the treaty) of how many ABM interceptor missiles the Soviets would have in 1980 was 8,000 to 10,000. That is a lot more than the number they have now, which is less than 100. They certainly could have done a great deal more.

Everything we know about their doctrine and their history indicates that if it were not for the ABM Treaty, they would have plodded ahead and deployed as many as they could have of rather lousy, but still worrisome, ballistic missile defense systems. They have not done that.

The problem is that they do have one radar that looks like an early warning radar too far inland. It may be a space track radar. It could serve that purpose. But based on the information we have, it looks like a violation.

Senator LEVIN. Why do you think the Soviets are building something which so obviously looks like a violation? What is the real motive?

Is it to give them battle management capability, to give them early warning, to save them building two radars further out, to build one in that particular place to serve that function?

What is their military purpose in doing something that seems to be clearly a violation of the ABM if in fact they believe in the ABM Treaty as they say they do?

They are worried about SDI because it violates the ABM Treaty. What is their motive?

Dr. CARNESALE. I don't know their motive. They have always been conscious of early warning, trying to close all the gaps. (This is an unclassified session, so we can't go into detail.)

This radar would be consistent with an early warning radar capability that you could imagine them wanting to have. I don't know their motive beyond that. Building at this location surely is a lot cheaper than trying to build in the permafrost, and there may be no easy way to get to a suitable site.

Second, there is some degree of ambiguity about it all. In treaties, there is always some no-man's land. But that means no-man's land for Americans, not for the Soviets. They walk right through no-man's land up to the other side. They take advantage of any ambiguity, whereas we are prone to stay outside any realm of ambiguity.

Senator LEVIN. Mr. Chairman, I want to thank both these gentlemen for coming on short notice. I don't know if either has written testimony this morning. Because the notice has been so short, I doubt either of them does.

In that event, could we offer them at least the opportunity to provide written testimony if they wish for the record?

Senator WARNER. Certainly they can supplement the record as they desire.

Senator LEVIN. Could we offer them at least the opportunity?

Senator WARNER. We will leave the record open for whatever period seems reasonable.

Senator LEVIN. There was an article in the paper about a British intelligence report regarding to that radar at Krasnoyarsk.

Could we see if that British intelligence report which says it is ambiguous could be made available to this subcommittee somehow?

Senator WARNER. The Chair will look into it.

Any other questions?

We will proceed then to hear from Dr. Ashton Carter.

Thank you very much for coming this morning. I understand both of you gentlemen are associated with the same distinguished institution.

STATEMENT OF DR. ASHTON CARTER, ASSISTANT PROFESSOR OF PUBLIC POLICY, ASSISTANT DIRECTOR, CENTER FOR SCIENCE AND INTERNATIONAL AFFAIRS, JOHN F. KENNEDY SCHOOL, HARVARD UNIVERSITY

Dr. CARTER. That is correct.

Thank you for inviting me to testify before you today on this important issue.

I am a physicist by training. I have worked in the defense technical field and in strategic policy, both in the Department of Defense and here on the Hill. I am now a faculty member at Harvard and consultant to various Government agencies.

Today I am speaking as an individual and not on behalf of any organization with which I am or have been affiliated.

I have not had time to prepare any remarks. I will do my best to speak clearly from notes and I will try as best I can to avoid repeating the things we have already covered.

BALLISTIC MISSILE DEFENSE

The subject of ballistic missile defense has historically attracted high emotion. I think the reasons for that are intrinsic. It responds to our natural instinct to work free somehow of this staggering vulnerability to which society and even our military forces are subject.

Our national leaders should consider and periodically reconsider defensive measures. At the same time I know some consider defenses to be a search for a technical fix to an unpleasant reality.

My own personal view is that ballistic missile defense has long been, undeservedly so, a pariah among strategic subjects. This suppression of this subject is undeserved because there is nothing logical or natural about the strategic environment which we inhabit which eschews defense yet pursues a seemingly unbounded competition in strategic offensive arms.

I personally have long thought that ballistic missile defense should be in our bag of tricks for improving our strategic posture, especially as I worked on basing modes for MX and on survivability of our C^3I. In these areas the preponderance of the offense is numbing. It is very hard to guarantee survivability of these strategic assets in the future.

STRATEGIC DEFENSE

We are highly reliant on strategic defense today. These defenses are passive, not active. We hide submarines, we move our bombers, we harden silos, we proliferate communication nodes, and so on. So, why should we not have an option to add active defenses to these measures?

I also think that a treaty such as the ABM Treaty cannot serve as its own justification and should be dispensed with the moment it ceases genuinely to serve our national interest.

I realize that there has been a religion made of support for that treaty over the last decade and a half. Yet without a strong strategic and analytic basis, the support can't stand up for long. I, therefore, very much welcome the renewed discussion about both the President's speech and antiballistic missiles.

I think when the dust settles we will be glad we had this discussion, because it has gathered beneath its mantle some of the profoundest questions that face us in nuclear policy today.

It is no secret this debate has been a divisive one. It also is no secret that much of it has been beside the point. I think that is true because of five misapprehensions that are common in the discussion of this subject. Let me just briefly touch on those five misapprehensions.

Everyone wants to know about ballistic missile defenses, does it work or not?

It is very important to say in addressing this question, work for what purpose?

It is now well established in the discussion that one needs to refer to feasibility of concrete defensive goals. It is also well established that there are two broad categories of goals.

The first category would be to take at literal face value the idea of protecting society from nuclear attack with a perfect or near perfect defense.

The second category is less than perfect defense, to achieve militarily well defined goals such as protecting strategic forces, protecting other military targets, frustrating or confusing nuclear attack.

The first misapprehension I want to point out is this: The question of fulfilling that first goal is largely a technical question, but I don't think the second category is largely a technical question. I think that the second category has important technical components, but it is largely strategic and political. It is clearly possible to build ballistic missile defenses that have some degree of effectiveness. What one has to ask one's self is whether we have a mission and use in our policy for defenses we know how to build.

The first misapprehension is that both categories of defenses are being dealt with as technical questions on which scientists have some sort of last word. I think that is not true. In fact, I think that with respect to perfect defenses, the judgment of sound technical people in the defense community is being heard too little, and with respect to the second category perhaps technical people are being heard too much.

My own technical judgment after examining these technologies in some detail from the background of some years in ballistic missile defense is one that Al quoted to you: The prospect that emerging technologies of the kind we have identified will provide a perfect or near perfect defense—literally removing from the hands of the Soviets the ability to threaten damage to our country—cannot serve as a sensible basis for our public expectations or our national policy about ballistic missile defense. There is no proof of this statement any more than there is proof that it is impossible to build a perfect offense which gets 100 percent of all the bombs through; or a proof that in the year 2000 the United States and the Soviet Union won't have made friends and have no need for nuclear forces. There is no proof of this statement. It is a matter of judgment. It comes from examining factors general and specific to the technologies that go into such a defensive mission. So, it is a judgment, but I think it is a strong one and I know of no one in the defense technical community who differs in that judgment. I won't go into my reasons for this judgment. I think everyone who wants to have a judgment on this question really needs to sit down and say why they agree or disagree with my judgment.

A third misapprehension in the discussion about ballistic missile defense concerns the equating of a particular technological device—missile, laser, particle beam generator—with an overall defensive system. The kill mechanism has not been the key to ballistic missile defense for 25 years, since we first learned how to intercept a warhead. We have not deployed any ballistic missile defense so far because we have not been able to convince ourselves that we could employ that kill mechanism efficiently.

What makes ballistic missile defense such a different engineering task from building the A bomb or H bomb or going to the moon in

the Apollo project? There is a world of difference between competing with inert, unchanging, and benign nature and competing with a hostile intelligence intent on sabotaging your enterprise. Nature gives a single unchanging technical challenge to an engineer. An opponent gives him a number of changing challenges.

So, in making a judgment about offense versus defense, it does no good to talk about technological breakthroughs. That does not help make a judgment because offense makes breakthroughs, too. An x-ray laser device is believed by many people to be more appropriately a component of the strategic offense than of strategic defense. That is, it is better for attacking space-based defenses than it would be for comprising such defenses itself.

MUTUAL ASSURED DESTRUCTION [MAD]

The fourth misapprehension concerns two quite different uses of the term mutual assured destruction, or MAD.

In the first, MAD refers to a fact of life. It is a fact that if either side wants to do dreadful damage to the other, it can. We live today because the Soviets allow us to live. I don't see any prospect that this technological circumstance will change.

There is a strategic doctrine called minimum deterrence. It sometimes is also called MAD. I would prefer not to call it MAD, but minimum deterrence.

The problem with minimum deterrence is that many experts, and I would include myself, believe that effective deterrence and other national security objectives require nuclear forces capable of many other tasks besides assured destruction.

What you see today is people arguing about whether minimum deterrence is a good policy. Policy is something we can change and, in my view, discussion about our policy is the key to the whole SDI issue. Many of the supporters of SDI are disturbed by the extent to which minimum deterrence has dominated policy, and I share some of their concerns.

At the same time we can't overturn the fact of MAD. The misapprehension is to confuse the SDI as a research program with the SDI as a national initiative which will be a grand solution to all our military problems.

There are many reasons why ballistic missiles defense research is an important activity. I, myself, hope that these research activities, some of which are very good, do not become whipping boys for the grandiose claims made that ballistic missile defense can lead to some sort of grand solution.

If the Surgeon General came out and said, "I have a research program for biomedical research that will prolong life," you would say, "Well, that sounds fine and I will support it."

If the Surgeon General said, "I have a new research program called Quest for Everlasting Life," you would be a little uncomfortable with that kind of claim backing up a research program.

With these misapprehensions out of the way, let me conclude with five observations. First, the question of perfect defense has dominated the discussion about ballistic missile defense. This focus is misleading for two reasons. For one thing, it is wisely agreed that that is a possibility that is ignorably remote. For another

thing, discussing perfect defense emphasizes targeting of cities rather than targeting of military targets, yet the targeting of military targets is the heart of our strategic policy.

My second observation is that the serious substance of SDI is, in my view, the military value of less than perfect defense which in turn depends on one's views of the proper role of nuclear weapons. These views are fundamental.

Crucial to appreciating the potential value of less than perfect defenses is the importance of discouraging offensive attacks on military targets, attacks that are all too feasible today. The fear is that nuclear war will start not because someone wants to annihilate cities, but because someone is in a desperate circumstance with their conventional forces and attempts to turn to nuclear weapons, using them as the very powerful and decisive weapon that they can be.

One of the best rationales of SDI, in my view, is that it might be able to discourage that kind of temptation to use nuclear weapons.

Fred Hoffman, I gather, testified before this subcommittee and did a very good job of laying out that rationale. These more modest goals for less than perfect defenses might be satisfied soon, and without resort to space-based components where all the controversy is. They need not incorporate new and controversial technologies.

I think, though, that taking seriously strategic views of the kind that Fred Hoffman enunciated to you will necessitate complementary initiatives in air defense, civil defense, passive military defenses, and so forth.

A third observation is that the SDI as a research program at some level of support is uncontroversial. Everyone agrees that it should exist on some scale. I have nothing to add or contribute about what scale to set for that program. I think it should be set on the one hand by the views of research managers who have to trade off putting our R&D resources into strategic defense versus all the other military missions that we need to support with R&D and, on the other hand, by the politics of arms control and politics within this country. I don't have anything to add to that discussion.

A fourth observation: If we are really serious about ballistic missile defense and are not just talking about it, then we have to get serious about Russian ballistic missile defense. Getting serious about Russian ballistic missile defense means getting serious about penetration aids of all kinds, from decoys and volume maskers against terminal defense to antisatellite activities against boost phase defenses.

As a fifth and final observation, let me say I think it is very misleading to mix the ballistic missile defense question with the antisatellite question under some rubric of militarization of space as the Soviets have and as some people who are skeptical about SDI have. The two issues don't mix very well for about four reasons.

One reason is that they are responding to totally different military missions. The ASAT issue has to do with conventional warfare, with levels of warfare short of nuclear war. BMD belongs to a different military world which concentrates exclusively and specifically on the ultimate contingency of nuclear war. They really are quite different issues militarily.

Second, ASAT and BMD are very different technically. There is a superficial technical resemblance. Directed energy weapons can be used for both. But when you consider that antisatellite activity is something you can conduct over a long period of time and from many places, and boost phase missile defense is something you have to conduct in a short time over enemy territory, they are really quite different.

Another reason not to include ballistic missile defense in the space rubric is that, in my view, important ballistic missile defenses, the ones we stand a chance of making cost effective, aren't space based. A lot of ballistic missile defense has nothing to do with space.

Last, the antisatellite issue and ballistic missile defense issue are starting from quite different bases. Generally effective ballistic missile defenses are widely agreed to be sometime in the future, yet effective antisatellite systems are here now. Second, we have an ABM Treaty which, whatever its wisdom or merits, speaks directly and definitively to the question of ballistic missile defense, whereas antisatellite activities are essentially unconstrained. The desirability of constraining antisatellite activity to me is not clear. That is my personal view. But the antisatellite issue is another issue for another day.

Let me stop there.

Thank you.

Senator WARNER. Thank you very much.

PERSHING TARGETS IN NATO

I wonder if you would amplify your feelings on development of antitactical ballistic missile defenses of high value targets in NATO against Soviet intermediate ballistic missiles?

Dr. CARTER. That is one of the military missions for ballistic missile defense that has nothing to do with space. I think the boost phase systems are not the way to go at it. That is a task that we know how to do at some level technically. I don't think it is as much a technical question as a strategic question.

If we were to defend our air bases and other major military targets in NATO against the Soviet SS-20 in a genuinely effective way, then we might be able to make it less tempting for the Soviets to resort to those SS-20's in wartime and deterrence would thereby be strengthened.

There is a flip side to that. That is, if we get to build an ABM, they get to build one as well. We just got through the anguish of deploying Pershing and GLCM's because we felt our military strategy even more than Soviet military strategy requires us to have the ability to resort to nuclear weapons to do damage to targets in Eastern Europe that would support a Soviet conventional offensive. We have recently been enunciating our need to be able to have warheads penetrate and destroy targets in Eastern Europe.

So, if we have an ABM and they have ABM, it seems to me that if one reasons in a straightforward fashion from our NATO strategy, we might be the loser in the tradeoff. I don't think that is a technical question. That is largely a strategic question.

Conventional wisdom would have it that is a bad move for us because we need to be able to penetrate in Europe more than they need to be able to penetrate.

Senator WARNER. Thank you.

Senator Hart?

Senator HART. Gentlemen, I think from this Senator's point of view, what is increasingly fascinating about this whole SDI business is that it is a kind of metaphor for why it is hard to be a Member of Congress these days. This is overwhelmingly a technical field and a scientific set of questions.

Yet the politicians who are not technical people are forced to take positions and make judgments early on.

What is further fascinating is how the President can shift the debate in this country, and correct me if my summary analysis of where we stand is wrong. For 10 or 15 years there have come to be bipartisan, mainstream opinions about what is generally called the whole field of balistic missile defenses.

We have a negotiated treaty which, for good and valid reasons, people of both political parties supported which says we are not going to go forward on either side with a full-scale effort in this regard, but we are going to continue, within the framework of that treaty, some limited amount of research.

A billion dollars, Dr. Carter says, is not particularly limited; it is a lot of money. I think the record will show it is closer to $2 billion on average in the last several years if you add everything in.

Outside this mainstream there are a few individuals who have said that the technology has now gotten to a point where the whole debate has changed.

With all due respect to the individuals concerned, I think we all know that Dr. Teller, General Graham, and people like that before March 1983 were very much outside that mainstream.

Then came the President's speech which he now says was not based on any knowledge whatsoever, but his individual hypothesis that the way we have been going is all wrong. The President took his political entourage and shifted the mainstream. Now those of us who have been more or less in that mainstream supporting that research effort find ourselves trying to explain why we are not out there with the President in what was previously a kind of a never, never land.

I think it is even more complicated by the fact that the President was vague about, or even self-contradictory about what it is he is talking about. On the one hand, SDI is a research effort. On the other hand, it is a protective shield.

On the one hand, it is classified secret research.

On the other hand, we are going to give it to the Russians.

Is that a fair assessment of where we stand or not?

Dr. CARTER. I think it largely is. Several years ago, to discuss the ballistic missile defense at all—and I know because I was trying—was a hazardous activity from the other side. There has been a large change.

It is also true that when the President spoke, it was not clear at all what he was saying and everyone interpreted it differently. Dr. Teller and General Graham were two who did.

However lamentable it may be how we got where we are and how this started, and many people do believe that a major national initiative in the area of defense policy is not most appropriately launched from the very top, that is where we stand today. I think that the most responsible thing that we can do is to address the subject on its merits and recognize that if the judgment the Nation made about BMD a decade and a half ago still applies, we will make it strong again, and if it needs change in certain respects, we will change it.

It seems to me that the country forgot why it made the judgment it did a decade and a half ago. Maybe the circumstances have changed. In my own view, it is less the technical circumstances than the strategic circumstances that have changed.

In any event, it is appropriate for people to back up and reconsider and rediscover.

Dr. CARNESALE. I think you left out one element of the confusion. The President has been fairly consistent, I believe, in speaking primarily of the shield that was going to protect the Nation. Most member of the scientific community have no idea how to do that.

What the scientific community and the defense community are talking about are defenses of military targets. Fred Hoffman's report and his testimony say we ought to defend military targets.

The relationship between that and the President's vision is not easily seen. The President has been consistent, but the notion of, for example, defending ICBM's, bombers, or even command and control centers is not what the President's initiative was about.

It certainly is not where the public support is. If the $26 billion is not intended to defend us, but to defend our Minuteman, I don't think you would wind up with $26 billion. You would be lucky to wind up with $1.25.

It also is not a new idea. That is not what is new. Yet on the one hand here is where the public support is. And here is what we know how to do maybe, and trying to put those two together and keep from getting whipsawed back and forth is another element of the confusion and muddying up of the waters.

But that was not the President's doing. That is just the distinction between his vision and what we might actually be able to do.

Next, I want to touch on Senator Warner's question.

ANTITACTICAL BALLISTIC MISSILES

As far as antitactical ballistic missiles are concerned, there are no ABM Treaty limits on such weapons unless they are capable against strategic ballistic missiles. Let me mention an asymmetry other than the one Dr. Carter talked about. The Soviets would have an excuse to deploy ostensibly antitactical ballistic missile systems all over the Soviet Union to counter U.S. medium range missiles in Europe. We could deploy such defensive systems in Europe, but not in the United States. I don't like a tradeoff which permits defense in the Soviet Union, but not in the United States.

So, I think the idea of letting antitactical ballistic missile systems have a free ride is not a good idea. It was built into the treaty at our initiative to protect what was SAM—D. I thought it was a mistake. I argued against it, but I lost.

The Soviets did not object to that formulation. If I had been in their place, I would not have either. Competition in antitactical ballistic missle systems is not in the best interest of the United States because of the geographical asymmetry. It favors them, but it is not now limited by treaty.

Senator WARNER. Senator Cohen?

Senator COHEN. Professor Carnesale, the argument the administration is making is not that we are going to defend missile silos, but rather if we defend missile silos, we thereby enhance deterrence and, therefore, we will be defending the population.

Because the Soviets will have incentive to attack those, we will defend the silos. It comes back to the point that the SDI Program has been retreating into the realm of ambiguity. It has been retreating because every time there has been a specific goal assigned to SDI, it is shot down.

What Dr. Carter is saying is that those people who have supported research programs, are now getting pressured from the left and right and are caught in this cross fire as to what should be done.

An important point to consider is that by enlarging the size of the research program and spreading the money around, I would estimate, on a geographical basis, there will be a little bit to go all around the country. At the end of 5 years, it will be virtually impossible to stop the actual deployment of systems in which we have invested so much up to that time.

DEFENSIVE-ORIENTED SYSTEM

I still have a question in my own mind in terms of whether there is not some legitimacy to what Paul Nitze has been talking about. That is, whether there cannot be a negotiation of a transition away from a primarily offensive system to what might be a combination or a more defensive-oriented system. Whether that might not make sense over a period of time.

Probably half of that is whether pursuing it through negotiations is the best method to achieve that. It seems to me the incentive is to accelerate the offensive system and try to decelerate the defensive one at the same time.

Whether you could arrive at some kind of formula of reducing the offensive side of the equation and increasing the defensive side over a period of time. That does not seem to be the course right now.

The core of the SDI Program, as I understand, is that if we develop and deploy an effective strategic defense system, the Soviets will thereby realize the futility of their offensive missiles and have an incentive to reduce them. I can find nothing in our history or our experience that would lend support to that.

Yet that seems to be the core of the program: Demonstrate the futility of their offensive system, and they thereby have an incentive to reduce them.

Dr. CARNESALE. I think of an analogy there. People can have honestly different views on it. It is like supply side economics and the Laffer curve. Most people agree on the general shape of the Laffer curve. If the tax rate is zero, the Government is not going to get any money. If the tax rate is 100 percent, the Government will

not get any money. The argument is over where we are on the curve.

If one believes that defensive system will be near perfect or perfect, then it becomes so expensive to build offsetting offensive weapons that one becomes interested in deep reductions.

If, on the other hand, you are well on the other side of the defense effectiveness curve, you take the opposite view. You will choose to build offense to overcome the defense.

There are a few who believe our defenses will be so good that the Soviets won't be interested in offensive forces. Few of us can imagine that.

Certainly the Soviets can't assume the defenses will be near perfect. They are not likely to share that assumption. I think you are right. They will build up their offense.

Senator COHEN. What about negotiating the transition?

I think your words were initially we would prefer an invulnerable United States to a vulnerable United States.

Is there a possibility over a period of time of moving in that direction toward reducing the offensive, perhaps embodying that with some increase in defensive systems and shifting eventually to a more nonnuclear system?

Dr. CARNESALE. Technical people always believe the solution is to be found in the political world, and the political people always believe the solution will be found in the technical world. I think this one will take some of both.

I cannot imagine the transition happening so long as the United States and the Soviet Union are mortal enemies. I think some political accommodation will have to precede that technical accommodation. It is not unthinkable either. It is just that the time scale is different. I do not lose any sleep at night because the British could destroy virtually every city in the United States with nuclear weapons. It does not bother me. I don't have trouble going to sleep.

Even the French don't bother me much.

But it is going to be a long time before I could feel that way about the Soviets. Until then I don't think we can rely on trusting each other through this transition if one of us has a breakthrough. I don't believe it is impossible. I do believe it is possible. I believe it is our only long-term solution. It must be preceded by some degree of political accomodation.

Senator WARNER. Senator Levin?

Senator LEVIN. You testified that the likely Soviet response to the prospect of American SDI is more offense?

Dr. CARNESALE. Both.

Senator LEVIN. And also their own defense, but more offense rather than less is the likely response. That is exactly what they say their response will be, more offense.

So, this going ahead at tremendous speed with great emphasis on a strategic defense system could indeed be, in your view, counterproductive to our goal of deep cuts in offensive nuclear weapons.

Is that a fair statement?

Dr. CARNESALE. Yes.

Senator LEVIN. You both have testified also that the Soviets are likely to work on other countermeasures to a strategic defense system and that indeed we ought to be working on countermeas-

ures to a Soviet strategic defense system to make sure if they ever broke out of that treaty and deployed one, that we would be prepared to penetrate their defense.

COUNTERMEASURES TO STRATEGIC DEFENSE

That is what I would like to talk to, but in the few minutes I have, what, in your view, are the most likely countermeasures to strategic defense, including ASAT, by the way, because I think that is where they may come together, but what, in your view, are the most likely countermeasures to strategic defense, either their view of our strategic defense or our view of their strategic defense, and do you know whether or not we are pursuing research into those countermeasures in some rank order of likely success of the countermeasure working?

Dr. CARTER. I will start with that.

I think in looking at countermeasures we need to distinguish between these very far our defenses that we have been discussing in a very hypothetical way and about which serious discussion has only lasted 2 years or so and the kind of defenses that we know how to build and have known how to build for quite some while.

This second kind of defense is, in my view, the one to focus on.

First of all, as far as our own penetration aid programs go, what we are worried about is Soviet development activities concerning the kind of systems that we see them out testing and building prototypes of.

They are defenses of the traditional sort, radars on the ground, missiles on the ground, of the sort we decided not to build some 10 or more years ago. Penetration aids to those kinds of systems have been studied for a long time. There is an Advanced Strategic Missile Systems Program that does this.

There are decoys, volume maskers, chaff, and so forth, quite a variety. That is what we need to work on in the first instance and be prepared to field. In doing so, we will strengthen the ABM Treaty regime because it is a demonstration that we know how to handle the kind of defenses that they might attempt to deploy.

With respect to these farther out defenses, we really have to emphasize that serious discussion of these defenses is a very recent matter and they were considered to be on the fringe, as Senator Hart said earlier, years ago.

The reason they were considered to be on the fringe is chiefly not so much because no one ever expected that the laser and particle beams, and so forth, will ever be built.

The most important reason was that satellites are so very vulnerable: They are fragile, they are exposed. They are, in essence, fixed targets, because their orbits are fixed, we know where they are all the time. If they fly over your territory at the moment you want to launch your missile, you can get a clean shot at them.

So, vulnerability was one reason.

Another reason was that the directed energy weapons are themselves very potent suppressors of defenses. Even as they are good at working on boosters, they are pretty good at working on other defenses, as well.

This is the kind of thinking that has gone into countermeasures in boost phase. Right now it is in a very generic stage. We don't have any specific boost phase concept to study. We can look at Soviet ballistic missile defenses, specifically what their characteristics are, specifically what we can get through them. But no one has designed an explicit boost phase system in detail. One cannot make the countermeasures in detail.

Senator LEVIN. Do you know whether or not we are in fact researching countermeasures to that further out space defense you have just described?

Dr. CARTER. We are. I personally think it would be in our interest to do so rather more vigorously. That helps us design our own systems. It allows us to demonstrate to the Russians that it will avail them nothing to deploy poor defenses because we will be ready for them.

Senator LEVIN. And vice versa?

Dr. CARTER. And vice versa.

Senator LEVIN. Could I have Dr. Carnesale answer that question?

Dr. CARNESALE. In most of our work on advanced systems we use a "Red Team" to examine countermeasures. This helps us to assess the utility of our defensive system.

Senator LEVIN. My question related to countermeasures.

Dr. CARNESALE. I was referring to penetration aids for use against the kind of systems the Soviets could deploy rather quickly.

Until recently, our penetration aid programs were dormant. It is not a question of our having to do basic research. We know how to penetrate the kind of systems that use land-based radars and interceptor missiles. The countermeasures are decoys, chaff, MARVs, and the like. We should resume testing of penetration aids, which we have not been doing for a number of years. And we should start production, because we don't want to wait for the breakout to come before we warm up the production line.

I don't think the systems will have to be deployed. The services would resist deployment because they never like the idea of offloading any reentry vehicles to put penetration aids on. Nor would it be necessary.

But I would prepare to deploy penetration aids quickly in the event of a Soviet breakout. Not because I believe there will be breakout, but because I believe such preparation would help to deter it.

Those are things we know how to do, but are not now prepared to do.

Senator LEVIN. The last part of the question, countermeasures that are space based to their space based.

Dr. CARNESALE. We are doing that in a back-handed way. Nobody took Soviet space-based defenses very seriously. If we want to take our own space-based defenses seriously, then we have to take account of possible countermeasures. That is what we do.

Senator WARNER. Senator Exon?

Senator EXON. Gentlemen, thank you very much for being here. I have been listening to your testimony with great interest.

ARMS CONTROL AND ARMS REDUCTION

My questions have to do with not just SDI, but also all those other things designed not only to increase our security, but to maybe lead toward some kind of meaningful arms control and arms reduction.

So, I ask the questions in that context. I will ask them to both of you. I have so many things down here we will not be able to cover them all.

I intend to support funding for future research and development on SDI because I believe we must move ahead at least on research and development in this area if for no other reason that it is part of the best bargaining chip that we have.

The President does not share my view on that. But having said that, let me ask you a question that is uppermost in our minds now. I think it directly relates to SDI.

SOVIET VIEW OF MX

What is your view of the Soviet view of our MX?

Dr. CARNESALE. My view of the Soviet view of the MX?

I talked with a number of Soviets in Moscow. One of the difficulties we have discussing this issue with the Soviets is that if somebody above them has said black is white, then all argument must be consistent with black is white. We Americans are used to tradeoffs and to shades of gray.

I favor putting 100 MXs in Minutemen silos. In testimony I gave to the Scowcroft Commission early on, I said I thought it was a good idea. I thought that the benefits outweighed the undermining of crisis stability.

The Soviets cannot do that. What they dislike most about the MX is the danger that it poses to their ICBM's. Over 70 percent of their force is in land-based missiles. The notion that those missiles will become obsolete because they will be subject to counterforce attack is undoubtedly disturbing to them.

The fact that their missiles make ours vulnerable is not a consideration to them. They are worried about the counterforce potential of the MX, especially when coupled with the D-5.

Senator EXON. Aren't they obviously more concerned about the D-5 than they are the MX deployed in Minuteman vulnerable silos that they have had targeted for over 10 years?

Dr. CARNESALE. They are not more concerned about the D-5 because the D-5 is not here and the MX is.

Senator EXON. They know it is coming.

Dr. CARNESALE. But they will fight first the thing that is here now; they will fight D-5 when the time is ripe.

Also, they cannot assume that the United States will never be the first to use nuclear weapons. We tell our NATO allies that we are prepared to use nuclear weapons first. As crazy as it may seem to us, the Soviets can't rule out a U.S. first strike.

It has to be our declaratory policy that we are prepared to use nuclear weapons first.

Senator EXON. Most Americans don't understand that.

Dr. CARNESALE. I know that. Despite the fact that most Americans believe we would never strike first, the Soviets certainly cannot dismiss the possibility.

Senator EXON. Dr. Carter?

Dr. CARTER. I don't have anything to add to that. I agree with what he has said.

Senator EXON. It is my view, and correct me if you think I am wrong, that the principal reason, not the only one, but the principal reason, that the Soviets have returned to the bargaining table in Geneva is that they have a legitimate fear of our technological lead in the longer term with regard to our being able to develop some type of star wars or SDI. This is true, I believe, even though it might not be foolproof.

RETURN TO THE BARGAINING TABLE

Do you think that is the principal reason why they have returned to the bargaining table as opposed to other elements, MX being one?

Dr. CARNESALE. I think the SDI has been an important factor. Another factor, that we tend to forget, is that the United States has now had 6 years in a row of a real increase in defense spending. That is extraordinary in our history. Only once since World War II, did real defense spending go up 3 years in a row. Three times it went up 2 years in a row. This year is number 6; we are going for number 7.

If I were the Soviets, I would be interested in arms control agreements.

Their system just is not working very well. While all out competition is not a good idea from our point of view, it is even less of a good idea from their point of view.

Even if the Strategic Defense Initiative is not perfect or near perfect, it will cost a lot of money to overcome it. The fact that it might cost them less to overcome it than it costs us to deploy it is not in itself decisive. They cannot afford as much as we can afford.

There are a number of factors that brought the Soviets to the table. The SDI is an important one. Not because it is going to provide a perfect shield, but because it will be another stimulus for possibly great expenditure.

Senator EXON. Dr. Carter?

Dr. CARTER. I have only one thing to add. Identifying exactly what factor brought them back to the table depends on the inference one wants to draw from that factor.

If one draws the judgment that the SDI contributed to bringing them back to the table and further draws the inference that, it is therefore, a good thing for us, I think that second inference can't be justified.

The real question is what is the prospect that the SDI can mutually be incorporated in the arms control talks?

My own view on that is that since this is a research program and we can't very well trade our viewgraphs for their missiles, it really does not fit too well to make SDI a centerpiece of these negotiations. Research is something we agreed we both can do anyway.

Research is also something we have all along said we would not undertake to limit on a bilateral basis because of its problems with verification.

So, if SDI contributed to getting them back to the table, I am not sure that means SDI will be a centerpiece of those negotiations. It seems to me that in the negotiations we want to focus on concrete weapons and not on things that we are studying.

Senator EXON. My time is up, Mr. Chairman.

Thank you.

Senator WARNER. Gentlemen, we invited General Abrahamson back to complete his testimony. He was unable to finish on Friday. The Chair is ready to resume this hearing, but I would like to hear from Members.

Senator EXON. I am prepared to move ahead, Mr. Chairman.

I have one more question.

Senator WARNER. Go ahead.

If it is agreeable, we will convene at 11:07.

ARMS CONTROL AND ARMS REDUCTION

Senator EXON. Gentlemen, getting back to the old matter of arms control and arms reduction, I won't let you get away until I ask you this fundamental question.

How do you feel about the MAD principle and its effect on deterrence? Is it outmoded?

Dr. CARNESALE. Senator, this is something we both addressed in our opening remarks. I will just state that MAD is not a strategy, it has never been our strategy, it is not our targeting doctrine, and it is not the way we intend to use our weapons.

Nor is it the way the Soviets would use their weapons. They would go after military forces the same way we would. It happens to be the situation that if indeed you use a large number of weapons against military targets, you have assuredly destroyed the other side's society.

That is the situation today. Nobody likes it, nobody has it as an objective. Some of us like the idea of assured destruction, but not mutually assured destruction. But it is the situation and I know of nothing on the technological horizon that is likely to change that.

Senator EXON. So, what you are saying is that we have MAD whether we like it or not?

Dr. CARNESALE. That is right. Whether we like it or not, we have MAD as a situation, not as a doctrine and not as a strategy.

A lot of things go besides our cities in an all-out exchange of nuclear weapons. As you know, we don't target the population per se. They just happen to get killed as we go after recovery, command and control centers and leadership and the like.

Senator EXON. I am very fearful that we are back to that World War II strategy that we can destroy Berlin, that we can destroy Tokyo, that we can destroy anything without full recognition of what that kind of attack would mean to civilization.

I am afraid we are lulled into a lot of that thinking.

Dr. CARTER. I have nothing to add except to reinforce that distinction between a circumstance and a policy we can choose. The reason that MAD comes under attack today is the feeling that the

existence of MAD as a circumstance has unduly influenced the making of our strategic policy.

It has completely dominated our thinking about strategic weapons. The people in the pro-SDI camp think that we need to diminish that kind of thinking in our strategic policy and so attacking MAD is a way of attacking an undue influence on strategic policy.

Senator EXON. I believe whether you are for SDI in whatever form, with the number of weapons that each side has, if we got into an all-out exchange, everybody would be throwing everything at everyone.

If you cover all the military targets, you still would have plenty of warheads left to go around.

Mr. Chairman, thank you very much.

Thank you, gentlemen.

Senator WARNER. We thank both witnesses. We are well aware of the fact that this is a contribution on your part from the standpoint of your time away from your important work and the expense involved.

It has been a helpful contribution. Certainly Members of this committee and the Senate as a whole will avail themselves of the testimony you have provided this morning.

I thank you.

Dr. CARNESALE. Thank you.

Dr. CARTER. Thank you.

Senator LEVIN. Could we invite them to supplement their testimony if they wish?

Senator WARNER. Yes.

[Statement by Dr. Carnesale inserted for the record.]

PREPARED STATEMENT BY DR. ALBERT CARNESALE [1]

THE STRATEGIC DEFENSE INITIATIVE

"What if free people could live secure in the knowledge that their security did not rest upon the threat of instant U.S. retaliation to deter a Soviet attack, that we could intercept and destroy strategic ballistic missiles before they reached our own soil or that of our allies?" So asked President Reagan in a televised address to the nation on March 23, 1983. He responded in the same speech: "Let me share with you a vision of the future which offers hope. It is that we embark on a program to counter the awesome Soviet missile threat with measures that are defensive. . . . I am directing a comprehensive and intensive effort to define a long-term research and development program to begin to achieve our ultimate goal of eliminating the threat posed by strategic nuclear missiles." This announcement marked the birth of the President's Strategic Defense Initiative (SDI). The speech offered no hint of how the defensive task would be accomplished. It made no mention of space stations, or lasers, or particle beams. Unsurprisingly, however, the media could not resist the urge promptly to apply the label "Star Wars" to the President's vision. And the label has stuck.

This essay is intended to provide an introduction to the world of strategic defense and to formulate and address the key issues raised by the President's Strategic Defense Initiative. In short, the aim is to offer some guidance on how to think about the SDI.

BACKGROUND

Strategic defense is not a new idea. Americans, like others, have always preferred an invulnerable homeland to a vulnerable one. While the goal is a simple one, its

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achievement eludes us. Against large modern nuclear arsenals, invulnerability has not been an available option. Our cities are vulnerable to attack not only by the traditional elements of strategic nuclear forces, including land-based intercontinental ballistic missiles (ICBMs), submarine-launched ballistic missiles (SLBMs), and long-range bombers, but also by the long-range cruise missiles being added to the Soviet arsenal. And, of course, if these sophisticated vehicles for delivery were unavailable or ineffective, an adversary could resort to nuclear-armed torpedoes or to "smuggling" nuclear weapons in by civilian aircraft, yachts, fishing boats, trucks, or a host of other means. If our nation literally is to be invulnerable to attack, defense against all forms of delivery must be provided.

But the SDI is far less ambitious. It focuses solely on defense against ballistic missiles, which constitute the bulk of the Soviets' current longe-range nuclear arsenal. Ballistic missile defense (BMD) is an essential ingredient of any comprehensive strategic defense and is, in the words of the President, "an important first step." Like the SDI itself, this essay concentrates on BMD. It should be borne in mind, however, that even if the SDI were successfully to meet all of the challenges before it, there would remain many substantial obstacles to be overcome on the road to invulnerability.

BMD is a familiar subject. In the late 1960's, Americans debated intensely the question of whether to deploy the Safeguard anti-ballistic missile (ABM) system. (The acronym BMD has to a large extent replaced ABM in the jargon of national security specialists, with the two terms being used interchangeably to refer to defense against ballistic missiles.) The subject arose again in 1972 with the signing and ratification of the ABM Treaty emerging from the first phase of the U.S.-Soviet Strategic Arms Limitation Talks (SALT I). Much has changed since then in the world of BMD, especially in the realms of technology and military strategy.[1]

Ballistic Missile Defense Technologies

In principle, a ballistic missile could be countered during any of the four phases of its flight trajectory; namely, the boost, post-boost, midcourse, and terminal phases. (Destroying the missile before it is launched is not normally included under the rubric of BMD.) In the boost phase of a ballistic missile's flight, the multiple stages of the booster rocket thrust the missile up through and beyond the atmosphere. After the final booster stage has burned out, the missile enters the post-boost phase of its flight, during which the post-boost vehicle (also known as the "bus") maneuvers through space, directs the nuclear-warhead-bearing multiple independently-targetable reentry vehicles (MIRVs) toward their targets, and releases any decoys and other penetration aids. During the midcourse phase, these objects travel through inner space on ballistic flight paths. In the terminal phase, they reenter the atmosphere, with the lighter objects, such as decoys, slowing down more than the heavier reentry vehicles. For a typical ICBM trajectory, the thirty-minute flight time is composed roughly of three minutes of boost, five minutes of post-boost, twenty minutes of midcourse, and two minutes of terminal phase. An SLBM flight could take much less time, with the difference lying primarily in the duration of the midcourse phase.

To counter ballistic missiles in any phase of flight, a defensive system must perform the following functions: surveillance and acquisition; discrimination; pointing and tracking; interception and destruction; damage assessment; and battle management. Surveillance and acquisition refer to searching for and detecting any attacking ballistic missiles on their elements in flight. Discrimination means distinguishing the threatening objects from others (for example, identifying reentry vehicles among a host of accompanying decoys). Pointing and tracking refer to focusing sensors on a particular target, making a series of measurements of its position and velocity, and processing the data to estimate the target's future trajectory. Interception and destruction require directing an object or a concentrated energy beam (such as that emitted by a high-power laser) to the target—whether booster, bus, or reentry vehicle—and rendering it harmless. Damage assessment means determining whether the target has been destroyed or adequately damaged. Battle management

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[1] Soon after President Reagan's March 23, 1983 announcement of the SDI, two studies were commissioned, one on technology and one on strategy. James C. Fletcher directed the technology study and Fred S. Hoffman chaired the strategy panel. Unclassified summaries of the findings of these panels (known as the Fletcher Panel and the Hoffman Panel) appear in "The Strategic Defense Initiative: Defense Technologies Study" (U.S. Department of Defense, March 1984) and "Ballistic Missile Defenses and U.S. National Security: Summary Report," prepared for the National Security Strategy Study (U.S. Department of Defense, October 1983). For a comprehensive independent treatment of BMD issues, see Ashton B. Carter and David N. Schwartz (Eds.), "Ballistic Missile Defense" (The Brookings Institution, Washington, D.C., 1984).

encompasses all of the data transmission and processing, decisions, and communications involved in performing the defensive functions.

The SDI envisions a layered defense that would attempt to counter ballistic missiles in all four phases of flight. Each layer would serve as a backup to deal with the missiles or reentry vehicles that "leak" through the defensive layers directed at the earlier phases of flight. If the system were to consist of four independent layers, each 90 percent effective (i.e., if each layer countered nine out of ten missiles or reentry vehicles reaching the phase of flight at which it was directed), then only one nuclear warhead out of an attacking force of 10,000 would arrive on target. For layer efficiencies of 75 percent and 50 percent, the number of penetrating warheads would be 39 and 625 respectively. The prospect of a four-layer defense is new, because only recently have technologies emerged that offer any promise for conducting intercepts in the boost and post-boost phases.

Boost-phase intercept is most attractive to the defense because it eliminates in one fell swoop all of the reentry vehicles, decoys, and other penetration aids carried by the missile. But boost-phase intercept poses enormous technological challenges. Given that the planet Earth is (roughly) round, that the boostphase portion of flight of Soviet ICBMs is brief and occurs well below the line of sight from beyond the borders of the Soviet Union, and that the Soviets hardly can be expected to permit deployment in their homeland of American defensive systems, it follows that any attack on Soviet ICBMs in boost phase must be from space. (It follows also that the label "Star Wars" is not entirely underserved.) The defensive system component that directs the object or energy beam towardthe booster must either be stationed in space or be "popped up" into space by its own ballistic missle upon warning from space-based sensors.

No one knows what a boost-phase intercept system would look like or what technologies it would use. It might employ directed energy weapons such as chemical lasers, X-ray lasers (which are powered by nuclear explosions), beams of neutral atoms or charged subatomic particles, or microwaves. The device might be continuously orbiting in space or it might be popped-up on warning. One concept uses ground-based chemical lasers and a network of space-based mirrors to reflect the energy back down toward Earth to destroy booster targets. Kinetic energy weapons, such as rocket-propelled interceptors or high velocity projectiles fired from advanced electromagnetic guns, also might have a role in boost-phase intercept. For the most part, these advanced concepts are little more than gleams in the eyes of defense scientists, but the gleams are coming more sharply into focus. And it is not enough to develop a system that would work against current Soviet missiles; it must be able to deal with responsive threats. The offense could use a number of countermeasures to limit the effectiveness of boost-phase defenses including, for example, interfering with sensors and communications links, attacking space-based components of the defensive system, shortening the boost time and lowering the altitude of booster burnout, applying protective coatings, and increasing the number of boosters. It remains to be seen whether effective boost-phase intercept is possible.[2]

Destroying missiles in the post-boost phase, before all of the reentry vehicles and penetration aids have been dispersed, also could have high payoff for the defense. The system concepts and technologies that appear to be applicable to post-boost intercept are the same as those for the boost phase. But a bus is harder to track than a booster and is more readily shielded against the effects of directed energy weapons, so the BMD task in the post-boost phase is likely to be even more difficult than in the boost phase, making it most difficult of all.

Midcourse BMD is something we and the Soviets have known how to do since the 1960s, at least under rather restrictive conditions (e.g., a limited attack without sophisticated penetration aids). America's Sentinel and Safeguard systems had huge ground-based radars and long-range nuclear-armed interceptor missiles for midcourse intercept, and so did (and does) the Soviets' Galosh ABM system at Moscow. The midcourse phase offers the defense more time (about twenty minutes) to do its job, but disadvantages lie in the large number of targets (each booster can carry multiple reentry vehicles and scores of decoys), in having to discriminate reentry vehicles from decoys and other penetration aids, in the enormous amount of data to be communicated and processed, and in penetrating the shielding already built into reentry vehicles to enable them to withstand the heat and stress of atmospheric reentry. More recent technological developments include infra-red sensors (space-, air-, and ground-based) to help with discrimination, and homing interceptor missiles ca-

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[2]See Ashton B. Carter, "Directed Energy Missile Defense in Space: Background Paper" (Office of Technology Assessment, U.S. Congress, April, 1984).

pable of destroying the reentry vehicles in flight without resorting to a nuclear explosion (the latter capability was demonstrated by the United States last June in the Homing Overlay Experiment). In addition, any space-based defensive weapons deployed for use against boosters and buses could also play a role in midcourse BMD.

Terminal defense is the oldest of BMD concepts. It takes advantage of the filtering performed by the atmosphere, which leaves the decoys and debris behind the heavier reentry vehicles, to simplify the problems of target identification. But the defense has little time in which to act, because the reentry phase lasts only about two minutes and the intercepts must be conducted at high altitude to ensure that "salvage-fused" warheads (i.e., those designed to explode just before being destroyed) cannot carry out their destructive missions. (For this reason, among others, it is less difficult to defend a hardened military target, such as an ICBM silo, than a city or other soft target.) In recent years, the radars, interceptor missiles, and computers needed for terminal and late midcourse defense have been made much smaller and more capable than they used to be, and the prospect of highly accurate homing interceptor missiles has spurred interest in non-nuclear kill. Terminal defense, like midcourse defense, is something we and the Soviets can do. The technological questions relate to how well it can be done.

The challenge to defensive system designers lies not in "hitting a bullet with a bullet"; it lies in coping simultaneously with thousands of "bullets" and with potential countermeasures employed by a noncooperative adversary. As defensive technologies evolve, so too do the offensive systems with which they must deal, and the offense already enjoys an imposing head start.

SDI Funding

The SDI has been described by President Reagan as "a program of vigorous research focused on advanced defensive technologies . . . [that] will provide a future President and a future Congress the technological knowledge required to support a decision on whether to develop and later deploy advanced defensive systems." [3] Responsibility for the SDI has been assigned to the Department of Defense, under the direction of Lieutenant General James A. Abrahamson. DOD estimates that the SDI will cost about $26 billion over the period 1985–1989, of which $24 billion would be spent by DOD and $2 billion by the Department of Energy.[4] Before the Initiative was announced, the Defense Department was spending about $1 billion per year on strategic defenses, and had planned to spend approximately $15 billion over the 1985–1989 period. Thus, the SDI calls for a four-fold increase over the current spending rate and an increase of about $9 billion, or 40 percent, over what had been planned for such research. In 1984, strategic defense accounted for 3.7 percent of the Defense Department's total budget for Research, Development, Testing, and Evaluation; by 1989 it would account for 15.7 percent. The SDI, by any measure, is indeed "a program of vigorous research "

THE CENTRAL QUESTIONS

A program directed at defending the United States and its allies against missile attack and at reducing reliance on the threat of nuclear retaliation to deter agression surely has strong emotional, ethical, and political appeal. Yet, the SDI is controversial. Views differ widely on some of the most fundamental issues. The questions at the center of the SDI debate are these:

What are the objectives of the SDI?
Would it really work?
How much would it cost?
What would the Soviets do?
How would our allies and others react?
How would it affect arms control?
How would it affect the likelihood and consequences of nuclear war?

Each of these questions is addressed below.

Objectives of the SDI

What are the objectives of the SDI? In the beginning—that is, in the President's Star Wars speech—the goal of the SDI was ambitious and unambiguous:

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[3] See "The President's Strategic Defense Initiative" (Washington, January 1985) p.i. (The Presidential Forward is dated December 28, 1984.)

[4] Lt. General James A. Abrahamson, "Statement on the President's Strategic Defense Initiative," before the Committee on Foreign Relations, U.S. Senate, April 25, 1984.

> . . . I call upon the scientific community in our country . . . to give us the means of rendering these nuclear weapons impotent and obsolete.

Four days later, Defense Secretary Casper Weinberger reiterated this aim:

> . . . the defensive systems the President is talking about are not designed to be partial. What we want to try to get is a system that is thoroughly reliable and total . . . I don't see any reason why that can't be done.[5]

It was not long before administration analysts and spokesmen began to discuss "intermediate" deployments of BMD, limited in capability, and intended not to replace deterrence by threat of retaliation, but to butress it. The DOD strategy panel led by Fred S. Hoffman concluded (under the heading "The Preferred Path to the President's Goal: Intermediate Options"):

> The assessment in this study of the utility of intermediate systems is necessarily tentative . . . Nevertheless, it indicates that, given a reasonable degree of success in our R&D efforts, intermediate systems can strengthen deterrence. They will greatly complicate Soviet attack plans and reduce Soviet confidence in a successful outcome . . . Even U.S. defenses of limited capability can deny Soviet planners confidence in their ability to destroy a sufficient set of military targets to satisfy enemy objectives, thereby strengthening deterrence. Intermediate defenses can also reduce damage if conflict occurs. The combined effects of these intermediate capabilities could help to reassure our allies about the credibility of our guarantees.[6]

Lt. General Abrahamson later offered a rationale intended to reconcile the two approaches:

> We are frequently asked whether the purpose of the Strategic Defense Initiative (SDI) is to defend people or military forces. Accomplishment of both missions is essential to the ultimate goal, which is to provide security for the people of the United States and our allies . . . The highly effective defenses that we envision have three attributes which, we believe, would contribute to the ultimate objective. First and foremost, an effective defense against ballistic missiles would improve stability and reduce the likelihood of war by eliminating the military utility of a preemptive nuclear strike. Second, in the unlikely event—whether planned or accidental—that nuclear weapons would be used in the face of effective ballistic missile and other defenses, such defenses would save lives and limit damage. Third, by reducing the value of offensive nuclear forces, both military and economic incentives would be created for negotiated offensive force reductions.[7]

The President's science adivsor, George A. Keyworth II, picked up on the notion of the SDI countering ballistic missiles not by intercepting them, but by creating incentives for eliminating them. In a fall 1984 article entitled, "The Case for Strategic Defense: An Option for a World Disarmed," he wrote:

> Although we cannot disinvent nuclear weapons, and although nations will continue to distrust one another, heavily defended countries could nevertheless realistically enter into treaties to reduce nuclear forces to zero . . . Strategic defense therefore provides an option for a world effectively disarmed of nuclear weapons . . .[8]

And by the end of 1984, the President himself was speaking of near-term as well as long-term goals for his own initiative:

> In the near term, the SDI research program also responds to the ongoing and extensive Soviet anti-ballistic missiles (ABM) effort, which includes actual deployments. It provides a powerful deterrent to any Soviet decision to expand its ballistic missile defense capability beyond that permitted by the ABM Treaty. And, in the long-term, we have confidence that the SDI will be a crucial means by which both the United States and the Soviet

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[5] Interview with Secretary of Defense Casper Weinberger on "Meet the Press," NBC, March 27, 1983.

[6] Ballistic Missile Defenses and U.S. National Security: Summary Report," *op.cit.*, p. 2.

[7] Lt. General James A. Abrahamson, *op.cit.*

[8] George A. Keyworth II, "The Case for Strategic Defense: An Option for a World Disarmed," "Issues in Science and Technology," Fall 1984, pp. 43–44.

> Union can safely agree to very deep reductions, and eventually, even the elmination of ballistic missiles and the nuclear weapons they carry." [9]

In short, the SDI is supposed to render nuclear weapons impotent and obsolete, to be thoroughly reliable and total, to complicate Soviet attacks, to improve stability, to limit damage to military and civilian targets if conflict occurs, to extend to our allies, to hedge against Soviet breakthroughs in BMD R&D, to discourage the Soviets from expanding their BMD deployments, and to bring about nuclear disarmament. That's a tall order!

All of these goals would be met by an impenetrable shield—a BMD "bubble"—covering the United States and its allies. But what if the best achievable defensive system were substantially less than perfect? Then our cities, which are the most precious and most vulnerable targets, would remain at risk, and our security would continue to rest upon deterrence by threat of retaliation. Defense of military assets, such as land-based strategic retaliatory forces and command and control centers, would reduce the effectiveness of Soviet ballistic missiles against those targets, but would increase the effectiveness of our own ballistic missiles by improving their survivability. Comparable Soviet defenses would have the reverse effect. This strengthening of deterrence by threat of retaliation doesn't sound like what the President had in mind on March 23, 1983.

A plan for eliminating retaliation-based deterrence can hardly be the same as a plan for bolstering such deterrence. Sooner or later the United States Government will have to decide what the SDI is for.

Technical Feasibility

Would a ballistic missile defense really work? The answer, of course, depends upon many factors, including the number and nature of the targets to be defended, the level of protection required, and the characteristics of the attacking missile force. The notion that the SDI will come up with a perfect defense—that is, one that could intercept and destroy all ballistic missiles before they reached our own soil or that of our allies—is met with great skepticism, to say the least. In a background paper prepared for the Office of Technology Assessment of the U.S. Congress, Ashton B. Carter put it this way:

> The prospect that emerging "Star Wars" technologies, when further developed, will provide a perfect or near-perfect defense system, literally removing from the hands of the Soviet Union the ability to do mortal damage to the United States with nuclear weapons, is so remote that it should not serve as the basis of public expectation or national policy about ballistic missile defense (BMD).[10]

Citing this statement by Carter, scientists Hans A. Bethe, Richard L. Garwin, Kurt Gottfried, and Henry W. Kendall wrote, "Based on our assessment of the technical issues, we are in complete agreement with this conclusion." [11] And Stanford University physicists Sidney D. Drell and Wolfgang K.H. Panofsky concluded:

> We see no practical prospect whatsoever of constructing a strategic defense that can—lacking prior drastic arms control restraints and reductions—enhance deterrence, much less render nuclear weapons impotent and obsolete.[12]

The Defense Department's strategy panel was more optimistic, but guardedly so:

> In the long term, such [multilayered] systems might provide a nearly leakproof defense against large ballistic missile attacks. However, their components vary substantially in technical risk, development lead time, and cost, and in the policy issues they raise.[13]

Attractive as invulnerability to ballistic missile attack might be, it clearly should be viewed more as an aspiration than an expectation.

Defensive systems intended to meet more modest goals are more feasible (or less infeasible, depending upon one's point of view). Of the partial defenses, the kind most often considered is a defense of some or all of the ICBMs and long-range bomb-

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[9] "The President's Strategic Defense Initiative," op.cit., p.i.

[10] Ashton B. Carter, op.cit., p. 81.

[11] Hans A. Bethe, Richard L. Garwin, Kurt Gottfried, and Henry W. Kendall, "Space-Based Ballistic-Missile Defense," "Scientific American," December 1984, p.49.

[12] Sidney D. Drell and Wolfgang K.H. Panofsky, "The Case Against Strategic Defense: Technical and Strategic Realities," "Issues in Science and Technology," Fall 1984, p. 64.

[13] "Ballistic Missile Defense and U.S. National Security: Summary Report," op.cit., p. 2.

ers and the critical command, control, and communications facilities associated with stragetic forces. Such a defense would raise the "attack price" (i.e. the level of attack required to achieve a given amount of damage) and would decrease confidence in its success. An important question is how the cost of the defense would compare to the cost of offensive measures (e.g. additional ballistic missiles and penetration aids) sufficient to offset it. At the current state of offensive and defensive technologies, this cost-exchange ratio strongly favors the offense. A vigorous program of research on defensive systems could conceivably lead to a change in that situation.

The question of whether BMD would work cannot be answered with a simple yes or no. A defense which would provide perfect nationwide protection against ballistic missiles is extremely remote. Defensive systems capable of achieving some of the more limited objectives, however, are more readily envisaged. The technological hurdles lying in the path of such systems appear formidable, but not necessarily insurmountable.

Economic Costs

How much would ballistic missile defenses cost? No one knows. What we do know is that the Reagan Administration has requested authorization to spend $26 billion over the five-year period 1985–1989 on research required to support a future decision on whether to develop and deploy advanced BMD systems. It must be emphasized that the $26 billion is only for research. The cost of any defense that might actually be developed and deployed probably would make the $26 billion figure seem small. To estimate the cost of such a system requires some knowledge of the technologies emerging from this research, the objectives of the defense to be deployed, the offensive threat to be countered, the characteristics of the major components, and the nature and extent of the overall system. None of these essential parameters are now known. Total cost figures like $500 billion and $1 trillion have been tossed around by interested observers of the SDI scene, but these are pure guesses. No one knows what would be the cost of deploying a defense based on unknown technologies and intended to achieve unspecified objectives against an unidentified threat. Little is to be gained at this stage by arguing about whether or not the hypothetical defense would be worth the unknown cost.

Soviet Actions

What are the Soviets doing in the BMD area? Their BMD program got under way soon after World War II.[14] The first important development began with construction of the Moscow system in the early 1960s, and it was fully operational by about 1970. At that time, it consisted of 64 ABM launchers and associated ABM interceptor missiles, one large modern battle management radar (with another soon to be added), four sets of smaller radars to guide the interceptors to their targets, and a network of early warning radars around the periphery of the Soviet Union. In recent years, the original interceptor missiles have been replaced by newer versions suitable for midcourse and terminal intercepts and older mechanically-steered radars by modern phased-array (i.e., electronically-steered) ones. This upgraded Moscow system, even if expanded to the full complement of 100 interceptor missiles permitted by the ABM Treaty, provides some protection against small attacks, but is of no military significance against the American arsenal of about 7,500 ballistic missile warheads. (It is worth noting that the United States has no operational BMD. One site of the Safeguard system, at Grand Forks, North Dakota, became operational in 1974 and was ordered shut down in 1976 by a Congress that judged it not to be cost effective.

Additional developments in the Soviet BMD program have emerged in the past several years. These include a small, transportable phased-array radar which, if coupled with interceptor missiles of the types recently deployed as part of the Moscow system, could constitute an ABM system (designated by the West as the ABM-X-3) suitable for relatively rapid deployment.

The network of peripheral early warning radars also is being modernized. In this connection, a matter of particular concern regarding Soviet compliance with the ABM Treaty is a new phased-array radar under construction near Krasnoyarsk in central Siberia. This radar appears to U.S. intelligence analysts to be designed to provide early warning of ballistic missile attacks. But the ABM Treaty prohibits the development of such radars by either country "except at locations along periphery

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[14] For an excellent discussion of the role of BMD in Soviet forces and doctrine, see Sayre Stevens, "The Soviet BMD Program," in Ashton B. Carter and David N. Schwartz, *op.cit.*, pp.182–220.

of its national territory and oriented outward" (Article VI).[15] Since Krasnoyarsk is more than 500 miles away from the border of the Soviet Union, the Reagan Administration has charged that "The new radar under construction at Kranoyarsk almost certainly constitutes a violation of legal obligations under the Anti-Ballistic Missile Treaty of 1972." [16] The Soviets maintain that no violation is involved because the new radar is not for early warning. They hold that it is for tracking objects in outer space—a function explicitly exempted (in Agreed Statement F) from the Treaty limitations. This troubling issue remains to be resolved.

Defenses against aircraft are widespread in the U.S.S.R., with more than 10,000 launchers for anti-aircraft surface-to-air (SAM) missiles currently deployed, and modernization takes place continuously. (The United States has no such systems now in place.) The latest Soviet SAM systems are known as the SA-10 and the SA-12. The SA-10 is being widely deployed for defense against low flying bombers and cruise missiles, while the SA-12, which has only recently become operational, appears to have been designed to intercept not only aircraft and cruise missiles, but also tactical ballistic missiles (which reenter the atmosphere at lower speeds than the longer range strategic versions) and perhaps even SLBM reentry vehicles. Some analysts believe that further improvements in these systems, especially the SA-12, could enable them to conduct terminal intercepts against ICBMs as well. It is generally agreed, however, that penetration aids developed by the United States would, if deployed, enable U.S. strategic ballistic missiles to defeat these upgraded defensive systems.

Advanced technologies with BMD potential also are being explored by the Soviets, including research and development on directed-energy weapons such as lasers and particle beams. While the Soviet effort in this area has been more than that of the United States, neither seems to be ahead.

While the Soviets have devoted enormous resources to strategic defense, their progress has been steady but slow. The United States, in sharp contrast, has placed little emphasis beyond research on defensive systems, having generally regarded such efforts as futile. How would the Soviets react to a markedly invigorated American BMD program?

Not surprisingly, the Soviet reaction to the Strategic Defense Initiative has been consistently and strongly negative. Rhetoric aside, however, there are a number of concrete steps they might actually take in response to an American effort to develop and deploy an effective BMD system.[17]

The first-order military response would be to improve and, if necessary, to expand offensive forces to ensure that they could defeat the defenses. For example, the Soviets might equip their ballistic missiles with decoys and other penetration aids, increase the number of MIRVs on their large missiles, deploy reentry vehicles capable of performing evasive maneuvers, shorten the burn time of their boosters, "harden" the boosters against directed energy weapons, and proliferate the number of boosters. They might also deploy many bombers and cruise missiles, against which the SDI would provide no defense at all. (A nationwide air defense of the United States could be added, at an additional cost rivaling that of the ballistic missile defense.) The Soviets could try also to develop antisatellite systems for destroying any space-based components of a BMD system. Of two technical programs, one aimed at designing a system for destroying ballistic missiles from a platform in space and the other charged with designing a weapon for destroying the platform before it could accomplish its mission, most engineers would judge the latter program to be more likely to achieve success.

In addition to measures designed to counter the defenses, the Soviets could intensify their own defensive efforts. A nationwide U.S. BMD system probably would be met by a Soviet one (though not necessarily of comparable quality).

We cannot foresee the Soviet military response to the American initiative, but there is bound to be one. Parts of it undoubtedly have already been set in motion.

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[15] The full name of the ABM Treaty is "Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems." The Treaty is accompanied by "Agreed Statements" initialed by the heads of the American and Soviet negotiating teams and "Common Understandings" supported by the negotiating record.

[16] See "The President's Report to the Congress on Soviet Noncompliance with Arms Control Agreements," (The White House, Washington D.C., January 23,1984) p.4.

[17] See Sidney D. Drell, Philip J. Farley, and David Holloway, "The Reagan Strategic Defense Initiative: A Technical, Political, and Arms Control Asssessment" (Center for International Security and Arms Control, Stanford University, July 1984) pp. 27-29.

Allies' Reactions

How would our allies view a shift is U.S. strategy toward greater reliance on defensive systems? The preliminary results are in, and they vary only within the narrow range between skepticism and opposition.

There are at least 100 reasons offered by our European allies in opposition to an American BMD program that goes beyond the research phase. The first 95 of these are variations on a single theme: widespread strategic defenses would change status quo. For the four decades in which the offense-dominant approach to deterrence has been in effect, Europe has seen neither nuclear nor conventional war. Why, our allies ask, should we try to fix something that isn't broken, especially since we may do catastrophic damage in the process of attempting the repair?

The 96th reason stems from the conviction that, if the United States were to have an extensive ballistic missile defense, so too would the Soviet Union. This is of particular concern to the United Kingdom and France, each of which maintains its own independent deterrent force of ballistic missiles. The ability of these small forces to penetrate a much expanded Soviet defense could be seriously in question, thereby reducing markedly whatever military and political value they might have.

Argument 97 also relates to the Soviet defense. If the Soviets were to come to believe that their homeland was reasonably protected against an American nuclear attack, they could adopt a far more adventurous and hostile foreign policy, perhaps one that would lead to conventional war in Europe or Asia. Argument 98 is the mirror-image of its predecessor; i.e., if the United States were to feel significantly less vulnerable, it might act more adventurously and, therefore, increase the risk of conventional war.

The 99th argument maintains that if both superpowers were to find themselves substantially invulnerable to nuclear attack, they might then view the rest of the world as safe grounds for conventional and nuclear wars.

Reason 100 is the belief that, because strategic defense would be enormously expensive, resources would inevitably be diverted from other, much more sorely needed defense programs, such as improvements in conventional forces.

It must be stressed that these allied responses to the SDI are, as previously indicated, preliminary ones. Like most Americans, our allies and others are still trying to figure out what it all means.

Arms Control

How would the SDI affect arms control? The connections between the SDI and arms control are strongest in three areas: limitations on BMD systems, particularly those restraints embodied in the ABM Treaty; reductions in offensive nuclear arsenals; and constraints on antisatellite weapons.[18]

From its inception in the Star Wars speech, the SDI was to be "consistent with our obligations of the ABM Treaty." This condition was reaffirmed by the President in his December 1984 statement on the SDI: "The research that we are undertaking is consistent with all of our treaty obligations, including the 1972 Anti-Ballistic Missile Treaty."[19] To appreciate the constraints imposed on the SDI by the ABM Treaty, it is useful to review the relevant provisions of that agreement.

Nationwide defense is prohibited. Article I of the Treaty states:

> Each Party undertakes not to deploy ABM systems for a defense of the territory of its country and not to provide a base for such a defense, and not to deploy ABM systems for defense of an individual region except as provided for in Article III of this Treaty.

Article III begins with the words, "Each Party undertakes not to deploy ABM systems or their components except that," and then goes on to specify the permitted deployments of ABM interceptor missiles, fixed land-based launchers for them, and ABM radars. Thus, unlike most elements of international or domestic law, the ABM Treaty approach to governing deployments is based on the principle that what is not expressly permitted is prohibited. Moreover, the permitted deployments are severely constrainted quantitatively, geographically, and qualitatively. Each side is permitted only one deployment area of 150 kilometer radius, within which it may have not more than 100 fixed land-based launchers, 100 interceptor missiles, and strictly limited ABM radars. No other ABM deployments are permitted.

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[18] The discussion which follows is adapted from Albert Carnesale, "The Strategic Defense Initiative and Arms Control," prepared for publication in *Harvard International Review.*

[19] "The President's Strategic Defense Initiative," *op.cit.*, p. i.

All ABM systems are covered by the treaty. Article II provides the basic definition: ". . . an ABM system is a system to counter strategic ballistic missiles or their elements in flight trajectory . . ."
It is the capability of a weapons system that determines whether or not it is to be considered as an ABM system. This interpretation is reinforced in Article VI:

> . . . each Party undertakes . . . not to give missiles, launchers, or radars, other than ABM interceptor missiles, ABM launchers, or ABM radars, capabilities to counter strategic ballistic missiles or their elements in flight trajectory, and not to test them in an ABM mode . . .

If, for example, an air defense system or an antisatellite weapon "could counter strategic ballistic missiles or their elements in flight trajectory," it would count as an ABM system. (Note that the treaty limits only defenses against strategic ballistic missiles, and not defenses against tactical ballistic missiles. The line between the two may prove difficult to draw in practice.)

Only fixed land-based ABM systems may be developed, tested, or deployed. Article V includes an undertaking "not to develop, test or deploy ABM systems or components which are sea-based, air-based, space-based, or mobile land-based." Only fixed land-based ABM systems or components can move beyond research into development. Ambassador Gerard Smith, who headed the U.S. delegation to SALT I, provided the U.S. interpretation:

> The prohibitions on development contained in the ABM Treaty would start at that part of the development process where field testing is initiated on either a prototype or breadboard model. It was understood by both sides that the prohibition on "development" applies to activities involved after a component moves from the laboratory development and testing stage to the field stage, wherever performed. The fact that early states of the development process, such as laboratory testing, would pose problems for verification by national technical means is an important consideration in reaching this definition. Exchanges with the Soviet Delegation made clear that this definition is also the Soviet interpretation of the term "development." [20]

Despite this attempt to sharpen the distinction between research (which is permitted for all kinds of ABM systems and components) and development (which is prohibited for all but fixed land-based systems and components), the boundary remains somewhat fuzzy.

"Exotic" ABM systems and components, even fixed land-based ones, may not be deployed. Since Article III prohibits all ABM deployments other than the expressly permitted launchers, interceptors, and radars, any ABM systems or components based on exotic technologies (such as lasers, particle beams, hypervelocity electromagnetic guns, or other technologies capable of substituting for ABM launchers, interceptors, or radars) may not be deployed. A statement initialed by the U.S. and Soviet negotiators (Agreed Statement D) provides a basis for dealing with these futuristic systems:

> In order to insure fulfillment of the obligation not to deploy ABM systems and their components except as provided in Article III of the Treaty, the Parties agree that in the event ABM systems based on other physical principles and including components capable of substituting for ABM interceptor missiles, ABM launchers, or ABM radars are created in the future, specific limitations on such systems and their components would be subject to discussion in accordance with Article XIII [i.e., in the Standard Consultative Commission] and agreement in accordance with Article XIV [i.e., by amendment] of the Treaty.

The effect of this statement is to ban any deployment of exotic systems unless and until the Treaty is amended to permit such deployment. It should be noted, however, that fixed land-based versions may be developed and tested at agreed test ranges.

Verification is to be accomplished by national technical means. The term national technical means of verification refers to methods of monitoring compliance with an agreement which are under the national control of the parties. These means can include data collection systems based in space, in the air, at sea, or on the ground. Article XII includes obligations "not to interfere with the national technical means

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[20] "Military Implications of the Treaty on the Limitations of Anti-Ballistic Missile Systems and the Interim Agreement on Limitation of Strategic Offensive Arms," Hearing before the Committee on Armed Services, United States Senate (June 6,20,22,28; July 18,19,21,24 and 25, 1972) p. 377.

of verification of the other Party" and "not to use deliberate concealment measures which impede verification by national technical means of compliance with the provisions of this Treaty."

A Standing Consultative Commission is established. Article XII creates a U.S.-Soviet Standing Consultative Commission (SCC) in which the two sides will consider matters such as "questions concerning compliance," "possible changes in the strategic situation which have a bearing on the provisions of this Treaty," "possible proposals for further increasing the viability of this Treaty; including proposals for amendments in accordance with the provisions of this Treaty," and "proposals for further measures aimed at limiting strategic arms."

The treaty is of unlimited duration. While the two sides are formally to review the agreement at five-year intervals (Article XIV), it is of "unlimited duration" (Article XV) and remains in force unless one or both parties takes positive action to terminate it. Either party can withdraw upon six-months notice "if it decides that extraordinary events related to the subject matter of this Treaty have jeopardized its supreme interests" (Article XV).

This brief review of the ABM Treaty reveals that it and the SDI are on a collision course. For so long as the United States adheres to the agreement in anything like its current form, the obstacles to achieving the long-term objectives of the Initiative are insurmountable. Amendment or withdrawal would have to come before even some of the shorter-term objectives could be met. Few can imagine an effective defensive system that does not employ space-based components for countering offensive missiles in the early stages of their flight and land-mobile components for intercepting nuclear warheads as they reenter the atmosphere; yet, development and testing (as well as deployment) of such components are prohibited by the treaty.

The provisions of the agreement are subject to interpretation, and the line between permitted and prohibited actions is not always clear. At what point does permitted "research" become prohibited "development?" What distinguishes a "component" of an ABM system from a subcomponent of, or an adjunct to, such a system? To what extent may an anti-satellite system (or any system other than a dedicated ABM system) be capable of "countering strategic ballistic missiles or their elements in flight trajectory" before it is considered (for purposes of the treaty) to be an ABM system? Each of these questions is relevant to the SDI, and none can be answered precisely.

Calls for changes in the ABM Treaty come from all quarters. Those who believe that the treaty was a bad idea in the first place would terminate it as soon as possible. Some would prefer to maintain the treaty for now, but would modify it to permit some defenses of ICBMs and to relax the prohibition on development and testing of sea-based, air-based, space-based, and mobile land-based ABM systems and components. Others, who would prefer to see the treaty strengthened rather than weakened, would attempt to tighten the constraints on testing, to eliminate the ambiguities associated with dual-use systems, and perhaps even to ban all ABM deployment. Still others, concerned that attempts to amend the treaty might lead either to modifications far different from those originally intended or to the demise of the agreement, prefer to leave well enough alone and to rely upon the Standing Consultative Commission to work out individual problems as they arise.

The ABM Treaty is the only enduring formal accomplishment of fifteen years of Soviet-American strategic arms control negotiations. Its termination probably would signal the end of nuclear arms control--an enterprise whose future is clouded in any event.

How would the SDI affect the prospects for negotiated reductions in the offensive nuclear arsenals of the two superpowers? Proponents of the SDI maintain that strategic defense is just what is needed to pave the way to meaningful reductions. Effective defenses, they argue, would reduce the military utility of ballistic missiles and, therefore, weaken the resistance to eliminating some, or perhaps even all, of them. Others disagree, maintaining that the more likely Soviet response to an American defense against ballistic missiles would include expansion of and improvements in offensive forces to counter the U.S. defense, and probably also further deployments of Soviet defenses. They see the SDI as paving the way not to arms control but to an accelerated arms race.

This difference between the views of SDI proponents and opponents stems in part from differing assumptions about the effectiveness of ballistic missile defense. The perfect or near-perfect defense envisaged by SDI supporters would tend to discourage further Soviet investment in offensive ballistic missiles. But the far-less-than-perfect ABM systems seen by SDI opponents as available in the foreseeable future would permit a growing Soviet offense to maintain its decisive advantage over the defense. And, they believe, a growing Soviet offense is just what would be seen.

The ballistic missile defense systems available for deployment for the next couple of decades are unlikely to be more than moderately capable. Such systems would contribute little to reducing the vulnerability of the nation unless the offensive forces of the other side were severely constrained. But each side, in its conservative planning, is likely to overestimate the effectiveness of the adversary's defensive systems and to underestimate the performance of its own. Thus, deployment of defenses would heighten perceived needs to improve and expand—and not to reduce—offensive forces. Ironically, the SDI may need a highly cooperative arms control environment far more than it would foster one.

The technologies associated with ballistic missile defense and antisatellite (ASAT) weapons have much in common. BMD systems designed to attack ballistic missiles in the boost phase and the post-boost phase offer great ASAT potential. These BMD systems face challenges even more formidable than the ASAT task, because a ballistic missile attack would present a greater number of targets and would provide less time for their destruction. A boost phase or post-boost phase BMD almost certainly would have some critical components operating in space, for that is the only way to have a direct line-of-sight to the missile boosters or buses to be destroyed. Thus, the ABM Treaty prohibition on development, testing, and deployment of space-based AMB systems and components in effect bans boost phase and post-boost phase BMD.

After release by the bus, a warhead follows a trajectory quite similar to that of a satellite in orbit. Consequently, BMD systems designed to destroy warheads in the midcourse phase naturally overlap with ASAT weapons. Indeed, the Homing Overlay Experiment conducted by the United States Army in June 1984, which was heralded as having demonstrated a midcourse BMD capability, might almost as aptly have been described as a demonstration of an ASAT weapon.

BMD systems designed to destroy missile warheads as they reenter the atmosphere in the terminal phase of their flight have least in common with ASAT weapons. The overlap lies primarily in the radars employed for acquiring and tracking the targets and, in some types of systems, for guiding an interceptor missile to the target.

The ABM Treaty inhibits, but does not preclude, continued development, testing, and deployment of ASAT weapons. Determining the threshold at which an ASAT weapon has sufficient BMD capability to count as an AMB system for purposes of the treaty remains a knotty problem. And, as indicated previously, even moderately capable BMD systems may serve as excellent ASAT weapons.

Without the ABM Treaty or other meaningful constraints on boost, post-boost, midcourse, and terminal BMD systems, ASAT activities would be essentially unconstrained. On the other hand, an agreement limiting the development, testing, and deployment of some or all types of ASAT weapons almost certainly would reinforce the ABM Treaty.

This cursory examination of some of the relationships between the SDI and arms control suggests that vigorous pursuit of the initiative would require (probably by 1990 or so) either substantial modification or termination of the ABM Treaty, would dim rather than brighten the prospects for significant reductions in offensive forces, and would reduce still further the chances for an agreement imposing meaningful constraints on ASAT weapons. To those who believe that such arms control accords could make a useful contribution to U.S. security, these aspects of the SDI argue strongly against it.

The SDI certainly has gotten the Soviets' attention, and undoubtedly has contributed substantially to their renewed interest in arms control negotiations. But Soviet interest will wane if the United States is unwilling to place the SDI itself on the negotiating table. To be effective, a "bargaining chip" must eventually become part of a bargain. The question of whether or not the SDI is to be made available to U.S. negotiations for use as a potential bargaining chip will have to be decided before any serious progress can be made in nuclear arms negotiations.

Risk of Nuclear War

How would widespread ballistic missile defenses affect the risk of nuclear war? The answer to this question depends on the effects of BMD on deterrence, on the incentives for preemptive attack in time of crisis, and on the level of damage suffered if nuclear war should occur.

Virtually all Americans would prefer a world in which the United States had meaningful defenses and the Soviet Union did not to one in which the situation were reversed. The Soviets, no doubt, hold the contrary view. In the real world, either both superpowers will continue to eschew widespread ballistic missile defenses or both will seek them. These are the alternatives worthy of serious consideration.

To the extent that deterrence rests upon our ability to inflict high levels of damage on a potential aggressor, a substantial portion of our strategic forces must be able to survive attack and penetrate to assigned targets. Deployment of BMD to defend our land-based retaliatory forces and strategic command, control, and communication centers would improve their survivability, thereby strengthening deterrence. But a widespread Soviet BMD system would degrade the penetrability of our surviving forces (ICBMs and SLBMs directly, and bombers and cruise missiles indirectly by interfering with precursor ballistic missile attacks on Soviet air defenses), and in this way would weaken deterrence.

The net effect of increased survivability and reduced penetrability depends strongly on what is defended (and perceived to be defended) on each side. If the defensive networks unambiguously protect only retaliatory forces, and not the targets against which a retaliatory attack would be directed, deterrence would be enhanced. But if the defense protected a substantial portion of the national territory, including centers of population and industry, deterrence could be undermined. Unless a nationwide defense were very nearly perfect, cities would remain vulnerable. It is difficult to imagine a disarming strike so splendidly executed and a defense so effective that hundreds of nuclear warheads (of the many thousands in each superpower's arsenal) could not arrive on urban targets in a retaliatory attack. The ability to inflict "unacceptable damage" would not be affected by widespread deployments of the kinds of BMD system components currently available or likely to be over the technological horizon. No rational national leader could reasonably be convinced that his country would be better off with a nuclear war than without one.

Crisis conditions complicate the problem. Suppose the level of hostility between the superpowers (perhaps reflected in armed conflict somewhere in the world) were so high that one side or the other believed, rightly or wrongly, that the other intended soon to launch a nuclear first strike. The question then before the national leadership is whether the advantage gained by preemption would be sufficient to outweigh the alternative of waiting to see if nuclear war could be avoided. The choice is not between nuclear war and no nuclear war, but between nuclear war initiated by one's own nation and a strong possibility (but not a certainty) that it will be started by the other side. Under these conditions, the effect of BMD on the incentive to preempt (or, in the jargon of the trade, on "crisis stability") becomes important.

The conventional wisdom is that nationwide BMD favors the side that strikes first. It rests on the belief that a well coordinated preemptive strike by a superpower drawing upon its undiminished nuclear arsenal would be better able to counter defenses than would a ragged retaliatory attack launched by a crippled nation drawing only upon those weapons that had survived the preemptive blow. The argument has merit, but it is not the whole story. Implicit in this logic is the assumption that increased survivability of the retaliatory forces would be more than offset by their decreased penetrability. This assumption does not reflect some inescapable law of nature, but it is consistent with most theoretical calculations of the outcomes of (fortunately) hypothetical nuclear wars. Indeed, this assumption lies at the very heart of the ABM Treaty. The burden of proof should rest on those who maintain that it is wrong.

Space-based BMD systems present a special challenge to crisis stability.[21] Imagine a world in which we and the Soviets, despite the technical, military, and political obstacles, had managed to deploy highly effective space-based BMD systems. Such systems are likely to be far more effective in an ASAT role than in a BMD role, simply because the ASAT task is the easier one. Thus, each side's BMD satellites would be vulnerable to attack by those of the other side. It follows that a preemptive attack on the adversary's Star Wars satellites and other ASAT systems would render his homeland vulnerable to attack by ballistic missiles and, at the same time, ensure the continued relative invulnerability of one's own nation. In this imaginary world, preemption pays a high premium.

The instinctive appeal of the SDI lies largely in the hope that it might somehow reduce substantially the consequences of nuclear war. Perhaps someday, in the distant future, this might be achieved. In the nearer term, though more than a decade away, BMD might provide meaningful protection of our society against small attacks, whether launched intentionally or by malfunctions of machines or minds, provided that the attacking weapons are ballistic missiles. This is of little comfort in dealing with the danger of possible future nuclear threats from terrorists or pariah

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[21] See "Prepared Statement of Albert Carnesale," in "Strategic Defense and Anti-Satellite Weapons," Hearing before the Committee on Foreign Relations, United States Senate (April 25, 1984) p. 212.

nations, for they are most unlikely to have long-range ballistic missiles available to them if and when they acquire nuclear weapons. And even if they did, they need not choose to use the one form of nuclear delivery vehicle against which we had a defense. "Suitcase bombs" are the more likely threat from these quarters.

Against a large attack by a determined adversary with a nuclear arsenal comparable to that now in the hands of the Soviet Union, our society will remain vulnerable for decades to come. And their society will remain vulnerable as well. Mutual assured destruction (MAD) describes the world as it is, not as we would like it to be. Each superpower can annihilate the other, and each will take the actions necessary to maintain that capability for as long as it can. For now, our primary objective must be to ensure that these capabilities are not used. For the longer term, we must strive to replace this reliance upon deterrence with a regime less subject to catastrophic failure. But unless we satisfy the short-term objective, there may be no long term.

CONCLUSION

This essay is intended to deal primarily with the question of how to think about the SDI rather than what to do about it. Accordingly, it has sought to raise questions rather than to answer them. The issues are complex and involve difficult trade-offs. Objective and knowledgeable individuals sharing the same information can arrive at different conclusions. Yet, a reader would be justified in expecting the writer to disclose the general direction in which his own analysis leads him. My response follows.

Decide what we're trying to do. The central questions associated with the SDI remain not only unanswered, but largely unexplored. The SDI cannot simultaneously enhance and replace deterrence, be of clearly acceptable but inestimable cost, discourage and stimulate Soviet counteractions, calm and frighten our allies, reverse and accelerate the nuclear arms competition, and lower and raise the risk of nuclear war. The implications of the SDI—favorable and unfavorable—are only barely perceived, and certainly are not understood. Further study, discussion, and debate are required if the United States Government is to make an informed decision on what it is trying to do.

Control the momentum. There is general agreement on the need for some research on strategic defenses. At a minimum, the United States should maintain a program adequate to hedge against Soviet breakthroughs in BMD technology, to reduce the Soviet advantage in lead-time to deployment of BMD systems based on currently available technologies, and to search for an eventual replacement for deterrence by threat of nuclear retaliation. Disputes arise over additional objectives (and associated programs) and the intensity of the overall effort. Of particular concern is the political momentum being gathered by the Initiative. The 1985–1989 SDI budget authorization requested by DOD calls for fiscal year 1989 funding of more than four times the 1985 level. And administration officials continuously remind us that the SDI is the President's initiative, with all the prestige of his office behind it. Left unabated, these political forces will generate great pressure to decide to develop and deploy something as a result of the SDI, even if the SDI research program uncovers no technologies and system concepts worthy of development and deployment. The alternative, doing nothing, might be interpreted as a waste of $26 billion and a Presidential failure. To guard against the danger of being faced with such a choice, the rate of increase in SDI spending should be reduced. An expenditure of $15 billion over 1985–1989, as had been planned by the Reagan Administration prior to the announcement of the SDI, seems well more than adequate to meet the essential objectives of such a research program, yet not so high as to generate uncontrollable momentum.

Reaffirm the ABM Treaty. Evaluations of the ABM Treaty all too often focus solely on the constraints it imposes on U.S. BMD; that is, on the costs to the United States of continued adherences. But one must also consider the benefits to the United States; namely the constraints on Soviet BMD. The United States has no BMD system now fully tested and ready for production and deployment. The Soviet Union has a BMD system deployed now, and could increase the production rate for rapid deployment. The Treaty clearly serves U.S. interests. Accordingly, the United States should reaffirm its commitment to the ABM Treaty; should seek to reinforce the prohibition on giving ABM capabilities to air defense, ASAT, and other potential dual-capability systems; and should neither seek nor be receptive to amendments that would permit higher levels of deployment.

Counter Soviet BMD. The most effective military response to the threat posed by a widespread Soviet defense against ballistic missiles would be the deployment of

countermeasures against that defense. To hedge against (and to deter) a significant Soviet BMD capability that might be achieved rapidly (by deployment of transportable BMD components and/or by upgrading non-BMD surface-to-air missile systems to provide them with BMD capabilities), the United States should pursue a program of vigorous development and production of penetration aids suitable for use against such defensive systems.

Fortify deterrence. If there is one nuclear matter on which the political left and right agree, it is that deterrence by threat of nuclear retaliation is immoral, unsound, and unacceptable. One group would solve the problem by making nuclear weapons disappear; that is, by disarmament. The other group, no less magically, would neutralize them with perfect defenses. Neither approach offers realistic solutions to the problems faced by the United States and its allies. We may be uncomfortable with deterrence as the shield between us and annihilation, but it's the only shield we've got. Derogating deterrence serves only to undermine its credibility and impair its effectiveness. It does nothing to vitalize potential alternatives. Now and for the foreseeable future, our interests would best be served by fortifying deterrence, with words as well as with deeds.

Senator WARNER. The subcommittee will take a short recess, and then resume in executive session.

[Whereupon, at 11:05 a.m., the subcommittee proceeded to other business.]

EXECUTIVE SESSION

The subcommittee resumed in executive session, pursuant to other business, at 11:18 a.m., in room SR-222, Russell Senate Office Building, Senator John W. Warner (chairman) presiding.

Members present: Senators Warner and Exon.

Staff present: James F. McGovern, staff director and chief counsel; Robert F. Bott and Douglas R. Graham, professional staff members; Karen A. Love, staff assistant.

Also present: Romie L. Brownlee, assistant to Senator Warner; James R. Bodner, assistant to Senator Cohen; Henry D. Sokolski, assistant to Senator Quayle; Mark J. Albrecht, assistant to Senator Wilson; Alan Cameron, assistant to Senator Denton; and Janne E. Nolan, assistant to Senator Hart.

Senator WARNER. The subcommittee will come to order.

General, we welcome you back again. We thank you for your patience; and above all, your knowledge and professionalism.

You may proceed.

STATEMENT OF LT. GEN. JAMES A. ABRAHAMSON, U.S. AIR FORCE, DIRECTOR, STRATEGIC DEFENSE INITIATIVE

General ABRAHAMSON. I am delighted and I do encourage you to ask any questions.

As we indicated, I will try to give you a feeling about the programmatic side of the program and recognizing that both of you have had the benefit of discussion.

We are becoming more and more concerned about the ability to have sufficient general knowledge that an overall political decision could be made based on a fairly high level of confidence in that timeframe as a result of progress.

That does not mean that there was a national decision. If there was a requirement to somehow begin to deploy early, it is in my charter and my responsibility to develop some options that would be there and we are trying to bring those forward.

I will refer to some that I call mature technologies as we go through the earlier options.

Senator EXON. May I ask a question at this point?

Senator WARNER. Yes.

Senator EXON. General, I read a very comprehensive discussion a week ago Sunday in the Washington Post. There was one section that I clipped out which led me to believe that aside from what the Soviets are doing, aside from whether they violated the ABM Treaty or not, even if we went ahead with research and development on this proposal, our action would be a violation of the ABM Treaty.

Do you agree with that or not?

Do you know the quote I am making reference to in the Post?

General ABRAHAMSON. I am trying to remember the exact wording of the reference. The answer is absolutely no.

Even Gerard Smith and others who are concerned about the overall ABM Treaty and our adherence to it indicate that research could be accomplished.

In fact, during the Ambassador's statement before the Senate in 1982, that question was asked and Ambassador Smith in a unilateral U.S. interpretation to the Senate said, in his view, that research could go forward.

The real question is any specific test and how one deals with that test falls into two categories.

The first category is if there are technologies that lend themselves to being able to be tested, we could go all the way through and implement, deploy that kind of system. It has certain characteristics.

Those characteristics are that it would not exceed 100 launchers, that it would be guided by radar, although adjunct to that was not discussed, and that each launcher would have a single warhead. Multiple warheads are precluded.

Then they talked further about mobile system and that would mean putting those kinds of systems in a submarine; that deployment is clearly precluded. It is precluded that we conduct tests of a kind that would be launched from a submarine or mobile system, for example, in the ABM mode, fully capable ABM mode, and that same kind of prohibition then applies to space and other physical principles, meaning lasers, and those kinds of applications now.

However, we can do testing provided it is not fully ABM capable and we have had a very extensive review within the Department of Defense by a group of people who are separate from my office and their report now is due both in the House and in the Senate and it is going through the last multiagency clearance process.

We will lay out in that report some examples of some of the tests, what those will look like, and where we feel we have the capability to go forward and do tests.

Senator EXON. Under the treaty?

General ABRAHAMSON. Under the treaty, yes, sir.

Senator EXON. In other words, what you are saying is that you don't see any problem as far as treaty violations are concerned regardless of how much money we spend on research?

General ABRAHAMSON. That is right.

Senator EXON. When you get into testing then you are in some gray area? Is that what you are saying?

General ABRAHAMSON. No, sir. I am saying we can do testing in the research phase and we are making sure that we can do that in a fully compliant way.

Second, that we could even begin some early development.

However, at the point you clearly break into a treaty violation, at the point that you test something that is mobile or that breaks the treaty, there will come a time if the program were approved to go into development by the Congress and by future administrations most likely, that you would have to either change the treaty or decide that you would leave the treaty.

Senator EXON. We are going to be attacked all along the line on this very point that I am bringing up.

We are now accusing the Russians and we will be violating it ourselves later. I guess not being a student or expert on treaties, that certainly is a gray area to me.

What you are saying is that you think we can do anything we want with research and we can even test as long as our system is a ground-based system like the North Dakota, but as a layman, I can't quite understand what is the difference.

If we can shoot something off from a piece of ground in North Dakota, couldn't we with very minor changes shoot that same thing from a submarine?

General ABRAHAMSON. The answer is yes, you could.

Senator EXON. Then I guess I don't see the difference.

Senator WARNER. I share the Senator's view, having had some modest experience myself in engineering many years ago, but when you go in a laboratory to do research at some point you have to decide whether you want to go down the road.

As I understand your statement here, as long as those tests can comport with the ABM Treaty, you can test as much as you want, you can even deploy under that treaty a limited system.

General ABRAHAMSON. Yes.

Senator EXON. If that system could also be deployed on a submarine——

Senator WARNER. It would not be a breech.

General ABRAHAMSON. The potential is there. The ABM Treaty, of course, was intended again under the unilateral U.S. interpretation and the way I believe both nations are proceeding, it did say that you cannot stop research and you can't verify it.

Therefore, you can go forward with tests up to a certain point and that is our limit that we have to look at and be very, very conscious of that.

We are, in fact, being very straightforward in doing precisely things which are clearly within that treaty limit. The classified report will provide you with examples.

But it does lay out the policy, the restriction, and examples of the kinds of tests. I say that is now in the final stages of interagency coordination.

The treaty does not say anything about intent. The treaty is intended to recognize research and then to prevent deployment and full development, as I read the treaty. Both sides are able to do research under the limits of the treaty.

Senator WARNER. Perhaps we can pick that up as you go along.

Senator EXON. I think that is a key point with which we have to grapple.

Senator WARNER. I agree with you.

I would suggest, General, that you and your colleagues address that more fully and put something in the record.

The question has been carefully posed. The Senator from Nebraska points out we will be called upon to respond to that issue.

General ABRAHAMSON. I would like to offer the report itself for the record, our compliance report.

[The report referred to follows:]

Report to the Congress on the STRATEGIC DEFENSE INITIATIVE

1985

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SECTION I

INTRODUCTION

A. PURPOSE OF REPORT

This report describes the coordinated Department of Defense (DoD) research and technology efforts needed to meet the goals of the President's Strategic Defense Initiative (SDI). It is in response to various Congressional requirements, including Section 1102 of the Department of Defense Authorization Act, Fiscal Year 1985, (Public Law 98-525, October 19, 1984), and the Report on the Department of Defense Appropriations Act, Fiscal Year 1985, of the House Committee on Appropriations (House Report No 98-1086, October 10, 1984). This report has been coordinated with the appropriate Departments and Agencies of the U.S. Government.

B. SCOPE

This report encompasses the plans for current and future efforts by the DoD to achieve the goals of the SDI. It describes the Strategic Defense Initiative Program executed by the Military Departments, Defense Agencies and the Strategic Defense Initiative Organization (SDIO). The basic program is applicable to all SDI supported research and technology efforts leading to decisions on whether or not to implement a defensive strategy and pursue development of promising architectures for defense against ballistic missiles. This plan is designed as a basic tool in communicating a broad overview of the SDIO Program to non-SDIO agencies and groups.

SECTION II

BACKGROUND

A. INITIAL DEFINITION EFFORTS

In March 1983, the President called for an intensive and comprehensive effort to define a long-term research program with the ultimate goal of eliminating the threat posed by nuclear ballistic missiles. Two study teams were established, the Future Strategic Strategy Study (FS^3) Team and the Defensive Technology Study Team (DTST).

- The FS^3 team examined the potential role that defense against ballistic missiles could play in the future in enhancing U.S. and Allied security.

- The DTST defined, in a Technology Plan, a long-term research and development program aimed at an ultimate goal of eliminating the threat posed by ballistic missiles.

The DTS, commonly referred to as the Fletcher Study, concluded that powerful new technologies are becoming available that justify major new development efforts to provide future technical options for defense against nuclear ballistic missiles. The study called for the structuring of a broad-based research effort focused on establishing technical feasibility, as opposed to initiating system level development. The recommended effort was structured to permit a decision in the early 1990s on whether to proceed to system level development.

The FS^3, which paralleled the Fletcher Study, concluded that defense against ballistic missiles could make important contributions to our national security. The study recognized that the exact nature of these contributions could not be resolved until more is known about the technical characteristics and capabilities of defense systems. Nonetheless, the studies concluded that it was essential that options for the deployment of advanced defenses against the ballistic missile be established and maintained. Such defenses could offer an entirely new concept of deterring nuclear war based on defense against attack rather than solely relying on retaliation. Equally important, the FS^3 concluded that research acts as a hedge against Soviet success in this field. Finally, FS^3 identified criteria for treaty compliant research.

B. FORMATION OF THE STRATEGIC DEFENSE INITIATIVE PROGRAM

In January 1984, a research program based on the Fletcher Study was established as the Strategic Defense Initiative. The SDI is a comprehensive program established to explore and demonstrate key technologies associated with concepts for defense against ballistic missiles. The Defensive Technologies Study (DTS) was used as a general guide for initiating the program. Principal emphasis was placed on technologies involving nonnuclear kill concepts. (Research on nuclear directed energy weapons is undertaken to develop an understanding of the potential of this technology and as a hedge against Soviet work in this area.)

Specific research efforts were organized in five areas:

- Surveillance, acquisition, tracking, and kill assessment (SATKA)
- Directed energy weapons (DEW) technologies
- Kinetic energy weapons (KEW) technologies
- Systems concepts; battle management (SC/BM)
- Survivability; lethality; and key technologies (SLKT)

The DTST, after identifying the technology activities needed to determine that a robust defense against a responsive ballistic missile threat is possible, projected the cost and schedules for two programs:

- A funding-limited program that proceeded at a rate supported by the Service and Agency funding allocated to the programs that predated SDI and were subsumed into it, and
- A program that proceeded at a technology-limited pace to provide the opportunity for decision in the early 1990s.

The technology-limited pace was selected.

For this technology-limited pace the DTST recommended $2385 million for the first year of the SDIO research and technology efforts. The FY 1985 budget request by the DoD limited this initial year to $1777 million while planning to reach the DTS recommended pace in FY 1986.

C. ACCOMMODATING FY 1985 RESOURCE CUTS

In the FY 1985 Appropriations Conference Report (98-1159), the conferees of the House and the Senate agreed to a general reduction for the SDI program from the President's budget request of $1777 million to $1400 million. After careful consideration of the alternatives, the Strategic Defense Initiative Organization reallocated the available funds in a manner that attempted to minimize the negative effect of the reduction on the overall goals and objectives of the program. A primary criterion used by the SDIO in reallocating resources was that technological questions must be provided with answers based on solid research in order to permit a valid assessment of the full potential of defensive systems. In making the adjustment necessary to meet the appropriation by Congress, the SDIO applied an overall strategy to maintain as best as possible the program goals, time lines, and tasks described to Congress in 1984 testimony. This reduction logic, first, ensured that in FY 1986 the program will be in a posture to reach the pace and scope planned at the program's inception. An effort was made to minimize the cost impact on existing programs. Then, major adjustments were implemented on certain programs inherited by the SDI that needed to be restructured to satisfy SDI needs. For most new starts implementation was delayed. For existing programs the SDIO frequently either delayed program enhancements or stretched

out or temporarily interrupted the flow, when it was possible, without interrupting continuity. Finally, some programs were continued at the planned pace, because they are fundamentally important to the decisions that must be made in these early stages of the program.

While the DoD was generally successful in meeting its overall strategy, achieving the planned funding levels in FY 1986 has become much more important if the program is to continue the goals, time lines, and tasks of the SDI. Since FY 1985 is the first year of the Initiative, the SDIO was able to minimize program delays by slipping new starts on a month-by-month schedule. In making these adjustments, the SDIO was cognizant of the fact that slipping efforts completely into the next fiscal year is often unwise, because potential, continuing resolution constraints and the normal contracting process could add several months of additional delay.

Reallocation difficulties were exacerbated by the fact that the FY 1985 reductions were significant (21%). The SDIO was reluctant to cut back those programs which are not only a necessary part of the SDI, but also are required for other programs (such as improved missile attack detection and warning programs). The FY 1985 reductions were clearly detrimental.

SECTION III

SDI GOALS, DEFENSIVE OPTIONS AND TECHNICAL OBJECTIVES

A. INTRODUCTION

Deterrence of nuclear war is the cornerstone of U.S. national security policy. Achieving a long-term, stable deterrence in the face of a growing nuclear threat has been, and will continue to be, a major foreign policy and military objective of the United States. Since the 1960s, U.S. strategy for maintaining that deterrence has been to field offensive nuclear forces that are capable of effective retaliation after absorbing a first strike directed at those forces.

If the large current Soviet investment in both offensive and defensive capabilities continues, it could destroy the foundation upon which the policy of deterrence has rested for several decades. The President, in establishing the Strategic Defense Initiative, recognized these trends and saw new opportunities in emerging defensive technologies to enhance deterrence and stability.

B. GOAL OF THE STRATEGIC DEFENSE INITIATIVE

The goal of the SDI is to conduct a program of vigorous research focused on advanced defensive technologies that may lead to strategic defense options that could:

- Support a better basis for deterring aggression;
- Strengthen strategic stability;
- Increase the security of the United States and its Allies; and
- Eliminate the threat posed by ballistic missiles.

The SDI seeks, therefore, to exploit emerging technologies that may provide options for a broader-based deterrence by turning to a greater reliance on defensive systems.

Since the President's speech in 1983, many have attempted to interpret what his vision entailed and what the SDI was expected to accomplish. Contrary to conflicting reports, the goal has not changed but has, in fact, remained consistent with the direction outlined by the President. The driving force behind his concept is freeing the world from the fear of nuclear conflict. It should be stressed that the SDI is a research program that seeks to provide the technical knowledge required to support a decision on whether to develop and later deploy advanced defensive systems. It is not a program to deploy those systems. All research efforts will be fully compliant with U.S. treaty obligations.

C. SDI PURPOSE AND POLICY

The President's Strategic Defense Initiative, (a White House pamphlet dated January 1985), makes clear the purpose of the SDI research program and the policy under which it is to be conducted. The purpose is described in the following way:

> "The President announced his Strategic Defense Initiative (SDI) in his March 23, 1983 address to the nation. Its purpose is to identify ways to exploit recent advances in ballistic missile defense technologies that have potential for strengthening deterrence--and thereby increasing our security and that of our Allies. The program is designed to answer a number of fundamental scientific and engineering questions that must be addressed before the promise of these new technologies can be fully assessed. The SDI research program will provide to a future President and a future Congress the technical knowledge necessary to support a decision in the early 1990s on whether to develop and deploy such advanced defensive systems."
>
> "As a broad research program, the SDI is not based on any single or preconceived notion of what an effective defense system would look like. A number of different concepts, involving a wide range of technologies, are being examined. No single concept or technology has been identified as the best or the most appropriate. A number of nonnuclear technologies hold promise for dealing effectively with ballistic missiles."

The stated policy for conduct of SDI is described as follows:

> "As directed by the President, the SDI research program will be conducted in a manner fully consistent with all U.S. treaty obligations, including the 1972 ABM Treaty. The ABM Treaty prohibits the development, testing, and deployment of ABM systems and components that are space-based, air-based, sea-based, or mobile land-based. However, as Ambassador Gerard Smith, chief U.S. negotiator of the ABM Treaty, reported to the Senate Armed Services Committee in 1972, that agreement does permit research short of field testing of a prototype ABM system or component. This is the type of research that will be conducted under the SDI program."

D. IDENTIFYING DEFENSIVE OPTIONS

The U.S. is taking steps necessary to underwrite stability in the near term via the President's strategic modernization program of offensive forces and our complementary arms reductions negotiations. Even as this is done, the nature of stable deterrence in the future must also be considered. In looking to this future, it is instructive to consider the experiences of the past. It has been alleged that the introduction of defenses into our overall strategic mix would overturn the principles of deterrence that have worked

for 35 years. This thesis not only fails to take the history of the nuclear age into account but also rests on an inaccurate definition of the concept of deterrence. For the first four years of the nuclear era, the U.S. had a monopoly and was invulnerable to nuclear attack. For the next ten years, the only Soviet nuclear weapon delivery capability that threatened the U.S. was the bomber, and the U.S. maintained an extensive air defense network against it. Air defenses were deemphasized with the advent of Soviet ballistic missiles. It made little sense to defend against bombers when the major threat faced by the U.S. became the intercontinental ballistic missile (ICBM)--a threat against which we had no effective defense. Since then, many have come to view deterrence solely in terms of offensive capability. But strategic defenses offer the hope for creating a better, more stable basis for deterrence.

In pursuing strategic defenses, the U.S. goal has never been to eventually give up the policy of deterrence. With defenses, the U.S. seeks not to replace deterrence, but to enhance it. Furthermore, the United States does not view defensive measures as a means of establishing military superiority. Because the U.S. has no ambitions in this regard, a deployment of defensive systems would most usefully occur in the context of a cooperative, equitable, and verifiable arms control environment that regulates the offensive and defensive developments and deployments of the United States and Soviet Union. Of course, if a shift were made to a different and enhanced basis for deterrence, careful consideration must be given to preserving a stable environment. There are no plans to place U.S. reliance on new capabilities until it is known that they can work. That is what the SDI is all about--answering the fundamental scientific and engineering questions that must be addressed before the promise of these new technologies can be fully assessed.

E. ACHIEVING A TECHNICAL CAPABILITY

If the SDI is to offer a high confidence basis for decisions to pursue one or more defensive options, the research program must do several things. It must conduct a broad-based research effort that expands and accelerates the progress of the relevant technologies. It must identify and evaluate the potential effectiveness of candidate ballistic missile defenses that could be assembled and deployed from those technologies. It must provide a basis for showing how those defense options can be operated and maintained to do the job. Finally, all research activity must be conducted in accordance with applicable U.S. treaty obligations. (See Appendix B for compliance of the SDI with the ABM Treaty.)

To achieve the major SDI goal, the SDIO must bring along the emerging technologies in a logical, timely way in this the initial stage of the SDI. The overall research task is expected to bring the technologies to maturity in three developmental thrusts. First, the most mature technologies need to be validated to provide initial options based on defense architectures that are affordable, survivable, and effective. A decision to proceed to this initial step would implement a defense against the threat the U.S. believes will be in place at least until early in the next century. Alternatively, the decision could be to reserve these options as a simple hedge against Soviet breakout and deployment of a defense against U.S. ballistic missiles.

Second, the long-term viability of future defensive options needs to be ensured by demonstrating the feasibility and readiness of technologies to support more advanced defense options. And third, research needs to be conducted that encourages the innovation by the U.S. scientific community in a response to the President's challenge to aid SDI research in identifying new approaches for eliminating the threat of ballistic missiles.

To support future decisions on defensive options, diverse efforts producing essential answers to critical issues must converge. Affordable ballistic missile defense architectures must be identified. The technical feasibility and readiness for development of survivable and cost-effective systems capable of meeting and sustaining the performance needs of the architectures must be established. The doctrine and concepts of operation for applying the system elements of the preferred architectures must be formulated. Practical paths for implementing the strategy and deploying the needed defenses in the context of foreign relations and arms control must be defined.

F. THE TECHNICAL DEVELOPMENT PACE

A notional schedule for research and possible development and deployment would be comprised of four phases:

- The research program, begun by the President in his 1983 Initiative, would run into the early 1990s when decisions could be made by a future President and Congress on whether or not to enter into systems development. This research activity will be conducted within the constraints of our current treaty commitments.

- The systems development or full-scale development phase could begin as early as the 1990s, assuming a decision is made to go ahead. During this period prototypes of actual defensive system components would be designed, built, and demonstrated.

- A transition phase would be a period of incremental, sequential deployment of defensive systems. This phase could be designed so that each added increment would further enhance deterrence and reduce the risk of nuclear war.

- The final phase would be a period of time during which deployment of highly effective, multi-layered defensive systems would be completed and during which ballistic missile force levels could be brought to a negotiated nadir.

As a research program, SDI is focused on the first phase to bring defense options to the point where U.S. leaders, after consultation with the Allies, could make decisions on whether or not to proceed to the system development phase and subsequent deployment.

SECTION IV

THE RESPONSIVE THREAT

A. INTRODUCTION

SDI marks a departure in the U.S. approach to defense against ballistic missiles in that it is examining the feasibility of a system that could engage ballistic missiles and warheads along their entire launch-to-impact trajectories and support a defense of a wide range of assets, both military and civilian. In order to provide a basis for future SDI technology development, all the functions that a multi-layered defense system must possess need to be recognized, and the required performance at the component level needs to be assigned. These component characteristics and required performance are based on estimates of present and future threats to be defended against and judgments of possible near- and far-term responses to a U.S. strategic defense deployment designed to limit the effectiveness of such deployments. This brief section provides a discussion of the approach the SDIO will use in providing a comprehensive and impartial assessment of the evolution of the responsive threat.

B. DEFINING A RESPONSIVE THREAT

The methodology to be used in defining a responsive threat is a reiterative process (as graphically depicted in Figure IV.1). First, the present estimates of capability in ballistic missiles and trends in upgrading force structures represent a significant investment in national resources by an adversary. Such an investment will most likely not be abandoned nor will current commitments to enhance ballistic missile capabilities be abandoned to respond to an undefined U.S. defense based on what the U.S. can achieve with technology that can be developed in the near term. For this reason, the first task will be to define a series of defense architectures against the currently projected threat as a basis for subsequent countermeasure/counter-countermeasure analysis. Defense against current and near-term threats is not a trivial problem, and it will require the development of a broad range of stressing defensive technologies. By focusing on the near term, more advanced defense systems can be derived from architectures that are based on the minimum uncertainty in the threat and its characteristics. In addition, these architectures will be based on the minimum technological thresholds that must be exceeded if the defense system is to be viable. As a result, technically non-responsive system candidates can be rejected early. Finally, sufficient diversification of scenarios will be employed to explore fully the influence of attack strategies and tactics on the technical evolution of the SDI.

The reference architectures will then, based on U.S. understanding of an opponent's military doctrine, be used to identify potential responses and their impact on the architecture's performance. Effective responses will be evaluated for technical feasibility, capability of the adversary's existing technology base to support it, the development of additional capabilities, and the development time frame of an evolving responsive threat.

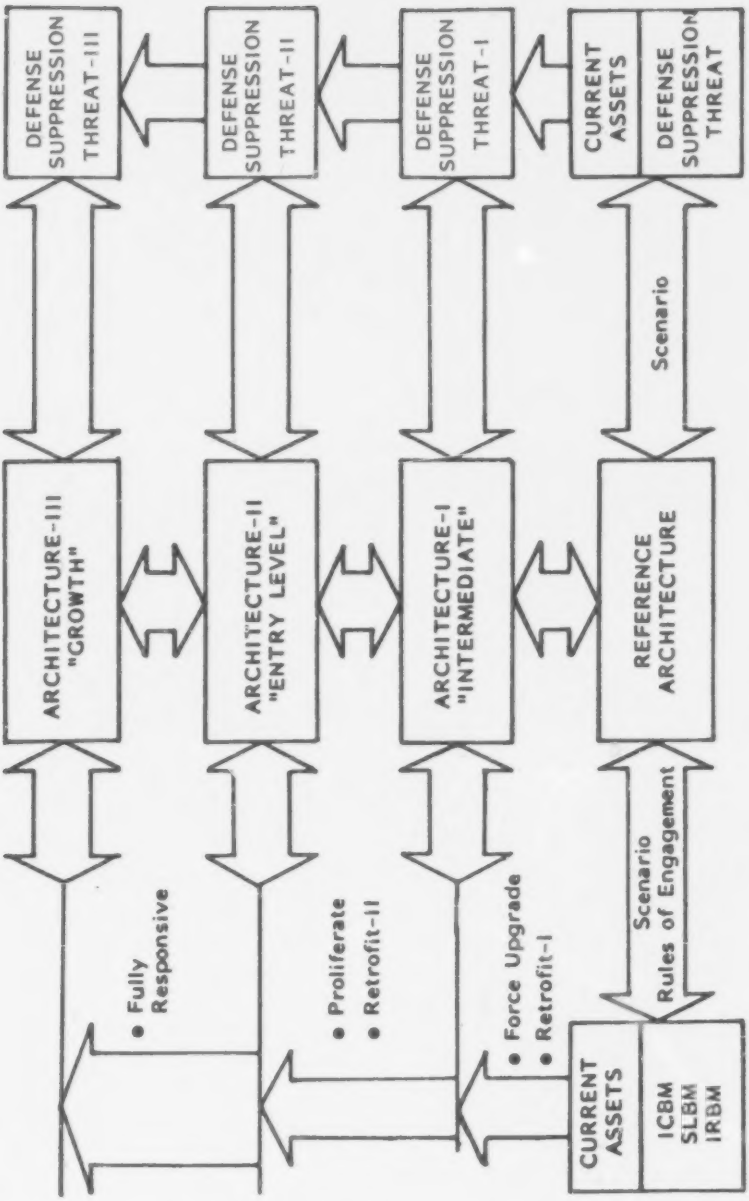

Figure IV.1. Responsive Threat Methodology

This first generation responsive threat can then be used to identify defensive architectures to overcome it. The responsive threat methodology can be processed again to refine SDI architectural capabilities such that the technology pace and required resources of the defense and this response favors the defense.

The ballistic missile threat of interest consists of ICBMs, SLBMs, IRBMs, MRBMs and SRBMs--intercontinental, submarine-launched, intermediate-range, medium-range, and short-range ballistic missiles--that could be targeted against the United States and its Allies. Over the next 20 years, the Soviets are expected to introduce qualitative improvements to their ballistic missile forces which would allow them to increase further their offensive strike capabilities. If ballistic missile force levels with multiple independently targeted reentry vehicles (MIRV) were no longer constrained by arms control agreements, the number of Soviet ballistic missile warheads could increase to at least twice their current levels with only a modest increase in the number of ballistic missile boosters. While the U.S. pursues defensive technology development, there are a number of political and technical approaches that might be used in an attempt to negate any such development and deployment of a defense against ballistic missiles. In the near term, the Soviets might employ a concerted political and diplomatic effort, first to force the United States to drop or delay the plans of the SDIO or, failing that, to negotiate them away. Over the long term, if the U.S. moves ahead with plans to deploy a defensive system, the response would depend on an adversary's expectations for the U.S. deployment program. Responses that enhance an existing ballistic missile capability could include:

- Increasing missiles, warheads, and penetration aids in an attempt to saturate the defense;
- Upgrading ballistic missiles with new boosters and warheads to attempt to evade the defense;
- Reducing signatures of these systems and warhead deployment techniques and missile-basing schemes that would make them less detectable;
- Hardening or modifiying ballistic missiles to reduce their vulnerability to defensive weapons; and
- Developing weapon systems and attack options to attack the defense.

Since this range of potential responses is broad, and since the time scale of the proposed SDI effort extends beyond anyone's ability to make accurate forecasts, no great precision in evaluating a potential adversary's course of action can be claimed.

At the same time, threats postulated as a response to defensive architectures must be credible and could require major development and revisions to the current threats. Many changes are much more easily envisioned than put

into operation. Many of the responses postulated so far are unproven, will require nontrivial R&D, and might have a deleterious, and possibly unacceptably adverse impact on the offensive capability of the missile force.

Finally, consideration must be given to techniques to negate directly any U.S. defense force. The defense suppression threat consists of those military efforts that will be seeking to suppress the U.S. strategic defense force by lethal and nonlethal techniques. Such techniques range from simple but massive brute-force measures to more sophisticated and subtle methods. It is likely that a defense suppression threat could evolve from today's techniques and such a threat would be detectable during development and testing.

Defense suppression attacks should be considered in terms of their overall strategic implications. For example, attacks against orbital elements of the U.S. defense force would have different implications than attacks on ground-based elements which could be considered to be an attack on the land masses themselves. Defense suppression attacks made on the U.S. defense force as a precursor to a strategic strike could significantly increase strategic warning time. Once the U.S. defense is in place, any attack on defended targets may entail allocation of a portion of the attacking force to defense suppression. Likewise, an attack against the U.S. strategic defense force which requires a large percentage of the adversary's strategic offensive strike capability cannot be considered realistic, as it would divert essential strike resources from other mission objectives.

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SECTION V

FUNCTIONAL RELATIONSHIPS OF A DEFENSE AGAINST BALLISTIC MISSILES

A. OVERVIEW OF THE DEFENSE ENVIRONMENT

A typical ballistic missile trajectory can be divided into four phases:

- A boost phase when the first and second stage engines are burning and offering intense, highly specific observables;
- A post-boost phase, also referred to as bus deployment phase, during which multiple reentry vehicles (RVs) and penaids are being released from a post-boost vehicle (PBV);
- A midcourse phase during which RVs and penaids travel on ballistic trajectories above the atmosphere; and
- A terminal phase during which trajectories and signatures are affected by atmospheric drag.

Short-range submarine-launched ballistic missile (SLBM) and intermediate-range ballistic missile (IRBM) trajectories have boost and terminal phases similar to ICBMs but, in most cases, have less extensive busing and midcourse phases.

In a defense capable of engaging ballistic missiles all along their flight path, certain key functions must be performed:

- Rapid and reliable warning of attack and release of defense assets for engagement. This requires full-time surveillance of ballistic missile launch areas (potentially worldwide) to detect an attack and define its location, order of battle, and intensity as a function of time; determine likely targeted areas for confident initiation of the battle; and provide track data for handoff to boost-phase intercept and post-boost vehicle tracking systems.
- Efficient intercept of the booster and PBV. In performing this intercept and kill function, the defense must be capable of dealing with attacks ranging from a few tens of missiles to a massive, simultaneous launch requiring 10 or more kills per second by the defensive weapons in the battle. In attacking PBVs, the defense prefers to attack as early as possible to maximize the number of RVs killed per PBV kill and minimize the number of decoys and penaids deployed.
- Efficient discrimination in the post-boost and midcourse phases through bulk filtering of lightweight penaids. This is required so that only expensive, space-consuming, heavy decoys stress the defense.

- Enduring birth-to-death tracking of objects in the threat cloud. This is required to permit long and multiple observations for discrimination and kill assessment and to enable unambiguous handover, with small error rates, of RVs to designated interceptors.

- Low-cost intercept in midcourse. The intercept and kill functions for a midcourse weapon involve recognition of the assigned target in the midst of a large array of penaids and junk, long-range delivery of the hit-to-kill vehicle to the vicinity of the target, terminal homing on the target, and collision with the target so that killing energy is delivered. In the case of beam weapons, pointing and dwell time on the target replace homing.

- High endoatmospheric terminal intercept. The terminal intercept and kill function involves relatively short-range delivery of warheads with sufficiently high performance to permit destruction at altitudes that are high enough to minimize damage on the ground due to salvage fuzing. A very fast interceptor is desired so that one can realize maximum benefit from atmospheric filtering of penaids and junk from the threat cloud. Terminal homing and fuzing complete the required functions.

- Efficient and timely battle management, communications, and data processing to coordinate and/or optimize use of defense resources for effectiveness and for economy of force are key to all phases.

- Timely kill assessment in all phases.

It is generally accepted, on the basis of many years of experience in applying air defense doctrine, study of defense against ballistic missiles, and experiments, that an efficient defense against a high level of threat would be a layered defense requiring all of the capabilities summarized above. For example, three independent layers, each of which allows 10 percent leakage, for an overall leakage of 0.1 percent, are likely to be less costly than a single layer that has the same leakage. Also, in the presence of boost-phase intercept, the attacker has great uncertainty whether the most important targets will be attacked, because he has no reliable way of predicting which boosters will be destroyed by the defense. This can be contrasted to the situation where only single coverage from terminal defenses exist and such defenses can first be exhausted and then the target attacked. The next few paragraphs describe the factors that dictate the use of multiple, complementary tiers. The discussion works backward through the ballistic missile trajectory to best illustrate the synergisms of a defense-in-depth.

The defended area of a terminal-defense interceptor is determined by how fast it can fly and how early it can be launched. Since terminal-defense interceptors fly within the atmosphere, their average velocity is limited. How early they can be launched depends on the requirements for discrimination of the target from penaids and accompanying junk and designation to the interceptor. A requirement for independent discrimination delays launch of the interceptor and reduces the footprint or defended area. Moreover, since the terminal defense of a large area requires many interceptor launch sites, the defense is vulnerable to saturation and

preferential offense tactics. Such structured, preferential attacks lead to a desire to complement the terminal defense with area defenses that intercept at long ranges. Such a complement is found in a system for exo-atmospheric intercepts in the midcourse phase.

Intercept outside the atmosphere forces the defense to cope with decoys designed to attract interceptors and exhaust the force. Fortunately, available engagement times are longer (approximately 1500 sec) than in other phases. This freedom from the tight time lines in boost (150 to 300 sec), post-boost (10 to 300 sec), or terminal (20 to 50 sec) phases strongly argues that a midcourse intercept system is an important element in a comprehensive defensive capability. The midcourse system must, however, provide both early filtering of nonthreat objects and continuing attrition of threat objects if the defense is to minimize the pressure on the terminal system. Since starting the defense process at midcourse accepts the potential of a tenfold to several hundredfold increase in targets from multiple independently targeted reentry vehicle (MIRV) and decoy deployment, intercept before midcourse is attractive.

For every booster with MIRV payloads killed, the number of objects to be handled by the remaining elements of a layered defense system is reduced by 10 to 100 or more. A very important additional feature is that such kills also disrupt the highly structured attacks that stress terminal systems. Ability to effectively respond to an unconstrained threat, therefore, is strongly dependent on the viability of a boost-phase intercept system. However, as noted earlier, a boost-phase system is faced with extremely short engagement times and potentially large numbers of targets. They dictate a weapons system that can deliver enough energy to each target in the limited available engagement time to ensure booster kill.

The phase of flight where PBV operations occur is treated as a separate case. This phase is potentially rich in information that can be used for discrimination. As this phase of flight proceeds, the leverage decreases as decoys and RVs are deployed. On the other hand, the post-boost phase offers up to 300 additional seconds for intercept by boost-phase weapons and may be the only phase accessible after certain Soviet boost-phase responses.

The natural and man-made phenomena and the required technology for each of these phases of a ballistic missile trajectory are different. Thus, it is useful to separate system concepts into these phases to discuss top-level performance goals, identify broad technical approaches to achieving those goals, and identify key issues to be resolved. The remainder of this section discusses these topics in the context of boost, post-boost, midcourse, and terminal defense systems. These discussions establish the basis for an investment strategy and for an analysis of the technology development needed to realize defense-in-depth concepts. These development needs are covered in the next section.

There is considerable overlap between phases, and some distinctions are made more for convenience in this discussion than because of major changes

in either phenomenology or technology. Furthermore, in each phase of a ballistic missile flight, a defensive system must perform the basic functions of threat detection, tracking, identification, intercept, destruction, kill assessment, coordination, and self-defense. These functions can conveniently be grouped under the headings of surveillance; target acquisition and tracking; weapon pointing and/or guidance; and energy delivery/-kill mechanisms.

B. FUNCTIONAL NEEDS OF THE BOOST PHASE (BOOSTER IGNITION TO INITIATION OF POST-BOOST VEHICLE OPERATIONS)

Functional needs and performance goals for defensive systems in boost-phase operations are highly sensitive to assumptions about the number of targets to be engaged as a function of time and/or assumed target vulnerability. The first assumption bounds the performance of the surveillance and target acquisition system, the battle management and data processing system, and the fire-control or weapon-guidance sensors. The second assumption (target vulnerability) has a major impact on the performance of the weapon. Both dictate the number of weapons required. Survival and endurance of boost-phase systems can be crucial.

- Surveillance. The requirement to detect launches and associate target signatures with specific booster tracks is fundamental. Once launch is detected, the system must be capable of handling large numbers of individual targets during the few hundred seconds or less of booster launch in the presence of natural interference from the sun and earth background, and, perhaps, active deception or countermeasures. This same surveillance system would provide handover to the midcourse tracking system that must acquire and track the PBV during its maneuvers and initiate birth-to-death tracking.

- Target Acquisition, Tracking, and Pointing or Weapon Guidance. Once the individual booster tracks have been identified, the battle management and C^3 system must allocate individual targets or groups of targets to a weapon or weapon platform. A sensor or sensors on or closely coupled to that platform must then acquire and track the cool body of the booster. The pointing accuracy required for this function can be quite stressing for some directed energy concepts. It can be relaxed for kinetic energy kill vehicles that have terminal homing and for some directed energy concepts.

- Energy Delivery Kill Mechanisms. Kill mechanisms must, in general, deliver from a few to tens of megajoules of energy to the booster or post-boost vehicle. Some weapons concepts attack targets serially using available battle time to move from target to target. In such systems, available retarget time is quite limited if required high kill rates are to be achieved. Other concepts engage targets in parallel and do not require rapid retargeting. Some concepts involve physically hitting the target with a homing warhead that must be terminally guided. Finally, one must sense, in near real time, whatever characteristic changes occur in the target that indicate that it has been successfully engaged.

C. FUNCTIONAL NEEDS OF THE POST-BOOST PHASE

The dispensing phase of a post-boost vehicle (PBV) begins at the end of booster burn and ends for each RV or penaid as it leaves the PBV or "bus". Accordingly, acquisition, tracking, and discrimination between RVs and decoys and debris are key functions that begin in this phase and continue into the midcourse phase. Since the target is the PBV, the target engagement and energy delivery functions are similar to those for boost phase.

- Surveillance. At booster burnout, the large, massive infrared signatures of the plume are replaced by the modest signatures of intermittent post-boost propulsion and the PBV body. If groups of objects can be classified, if a track file can be established for each group, and if the state vectors can be handed over to a birth-to-death tracker, the difficulty of discriminating RVs and masked RVs from other objects in later phases will be greatly reduced or the offense will be forced to use fewer, more complex decoys.

- Target Acquisition, Tracking, and Pointing or Weapon Guidance. The functional needs are essentially the same as for boost phase with some differences. For example, precision pointing now must be accomplished on bodies undergoing smaller but more frequently varying accelerations. While target signatures are much, much smaller than in boost phase, they should be large enough to support long-range acquisition and tracking.

- Energy-Delivery Kill Mechanisms. One would probably use boost-phase kill mechanisms in the PBV phase, although substantial differences in the vulnerability of PBVs and boosters are expected.

D. FUNCTIONAL NEEDS OF THE MIDCOURSE PHASE

Midcourse defense is the process of detecting and destroying an RV after its deployment from the PBV and before it reenters the atmosphere. Acquisition or handover, tracking, and discrimination are the key functions in continuing defense against ballistic missiles during this phase. With good discrimination, multiple engagement opportunities are available over the relatively long time of flight.

- Surveillance. An autonomous midcourse surveillance function requires sensors that detect all threatening objects in the midcourse regime, rapidly reject as many decoys and as much debris as possible, precisely track remaining credible objects (RVs and heavy decoys), discriminate the RVs, provide RV position and trajectory data of adequate accuracy for firing kill devices, and perform kill assessment. As in the PBV phase, groups of objects must be classified, track files established, and state vectors handed over.

- Target Acquisition, Tracking, and Pointing or Weapon Guidance. Precision tracking of designated objects is required to provide the position of the target needed for intercept. This consists of

trajectory predictions for battle management and handover to a midcourse hit-to-kill interceptor. In addition, position accuracy is needed for handover to acquisition, tracking, and pointing subsystems of directed energy weapons.

- Kill Mechanisms. Since the targets (RVs) must be protected against the heat and forces of reentry, they are inherently hard to thermal and impulse kill mechanisms. For high confidence, kill mechanisms must deliver a few tens of megajoules of energy to the target. The long duration of the midcourse trajectory (1500 sec) offers opportunities for multiple engagements even with modest interceptor velocities.

E. FUNCTIONAL NEEDS OF THE TERMINAL PHASE

A terminal defense is sought which protects both urban/industrial and military targets against the residue of an attack that has been engaged in all previous phases of its trajectory. Additionally, a terminal-defense element of a total strategic defense system could serve three separate but similar functions. It could provide the final layer in a defense-in-depth system, stand-alone defense against depressed trajectory SLBMs, and stand-alone capability for defense of Allies. It is assumed in this discussion that terminal defense needs are defined to exploit the major increase in terminal defense capability possible from the attrition and discrimination in the boost and midcourse elements of the system.

The driving requirements for the terminal tier are survivable defense of targets that are easily damaged by nuclear weapons or soft targets (i.e., cities, industry, etc.) and an affordable system that can defend the entire United States. Defense of soft targets demands a keep-out altitude above which all RVs must be killed to prevent damage to such targets. The need to provide this keep-out altitude over the entire United States requires that the defense elements have large footprints, i.e., the area defended must be large in order to limit the number of elements needed for full coverage.

- Surveillance. In order to identify the small fraction of lethal RVs reaching the terminal tier intact in the midst of a large number of objects detected, the terminal-phase system must acquire and sort all objects as they arrive in the upper layers of the atmosphere. The system must be able to use atmospheric filtering to discriminate against reentry decoys and junk (i.e. spent PBVs, tankage, RV deployment hardware, and the debris created by destruction of targets in the late boost phase and midcourse flight). Such discrimination actions will be based, where possible, on handovers from the midcourse engagements. Nonetheless, terminal defense must maintain, as an autonomous final line of defense, a separate surveillance capability while being able to use previous track files (if they are available) for efficiency.

- Target Acquisition, Tracking, and Weapon Guidance. An interceptor must be committed to each threatening object and given data to perform a "space-point intercept", i.e., it flies to its assigned

point in space. On arrival at that point, the interceptor acquires its target on its seeker and homes to kill its target. Homing accuracies depend on the warhead used. In order to correct the seeker-handover error in the very short time available, the homing vehicles must have good maneuver capability and very fast control system response.

- Intercept and Kill. The interceptor must have very high acceleration and burnout velocity. For targets that require the interceptor to fly a considerable distance, the intercept will take place near the required keep-out altitude. The high velocity of the interceptor permits it to have a relatively large footprint (defended area).

SECTION VI

PROGRAM OVERVIEW

A. THE RESEARCH AND TECHNOLOGY (R&T) PROGRAM

To provide the technological solutions needed, the SDI is exploring all facets of a layered defense. In pursuing the technology for such defenses, the SDI seeks to:

- Capitalize on the synergism derived from repeatedly engaging enemy ballistic missiles with a mixture of weapons, enabling the progressive layers to work together to mitigate any weaknesses of the individual elements;
- Exacerbate the uncertainty of a potential attacker in his ability to succeed in his attack by presenting him with a complex defense suppression problem; and
- Deny damage from limited ballistic missile attacks and limit damage from full-scale attacks should deterrence fail.

To succeed, the SDIO must understand a broad range of technologies in order to determine their potential to perform the five basic functions of any defense. As described in the previous section, these five functions are performed repeatedly in the separate engagements of ballistic missiles in their four phases of flight (boost, post-boost, midcourse, and terminal):

- Detection of the threat and alerting the defense elements;
- Acquisition and tracking of the threat to locate it in time and space;
- Identification of the threat and discrimination against decoys to ensure efficient allocation of the defense resources;
- Interception and destruction of the threat; and
- Assessment of the results of the engagement.

To focus the SDI efforts, activities have been grouped into five program elements. These elements are designed to: (1) advance the technology base, (2) conduct experimental demonstrations that validate the technology, and (3) conduct concept and development definition efforts which focus the overall technology development on those critical issues that must be resolved to establish feasibility.

The Surveillance, Acquisition, Tracking, and Kill Assessment (SATKA) Program Element includes a mixture of some of the most and least mature technologies being developed by the SDIO. It includes technology base efforts to support surveillance, acquisition, tracking, and kill assessment that provide: (1) data on the observables from ballistic missiles and their

warheads, (2) new radar and optical sensors capable of obtaining detailed imagery of warheads and warhead deployment, and (3) on-board signal and data processing capable of performing necessary computations right at the sensor. The experiments include three general classes: boost-phase surveillance, midcourse tracking, and terminal-phase tracking and discrimination. Space-based surveillance experiments are planned for the early 1990s to demonstrate survivable means of detecting and tracking boosters from very high altitudes in space. Other space-based sensor experiments are to be conducted in the same time frame to explore our ability to track tens of thousands of objects during midcourse flight. Such platforms may ultimately include active sensors to aid in discrimination. A sensor experiment will determine the feasibility of using optical sensors to aid in target discrimination. A terminal imaging radar experiment is planned to demonstrate rapidly evolving ground-based radar capabilities.

The Directed Energy Weapons (DEW) Program Element is advancing the state-of-the-art in the technologies for: (1) high power laser and particle beam generation, (2) optics and sensors for correcting and controlling the high power beam, (3) large, lightweight mirrors and lightweight magnets for focusing the beam on the target, (4) precision acquisition, tracking, and pointing to put and hold the beam on target; and (5) fire control to capitalize on those unique features of directed energy weapons such as the ability to measure and control the energy delivered to the target. The DEW technology program includes major experiments at the subcomponent level in the four concepts currently being examined: space-based lasers, ground-based lasers, space-based particle beams, and nuclear-driven directed energy. These concepts are candidates for boost and post-boost phase intercept and for discrimination functions in the other phases. In addition, selected subcomponents for these concepts will be integrated in on-the-ground experiments designed to test interface approaches and resolve technical issues arising from the integration. The work on nuclear-driven directed energy is largely pursued by the Department of Energy and is designed to establish its technical feasibility. Equally important, the work ensures that the U.S. understands the potential impact of these emerging concepts if they were to be used against it by an adversary. It should be reiterated that emphasis in the SDI program is being given to nonnuclear weapons for defense.

The Kinetic Energy Weapons (KEW) Program Element is a collection of related research that would make use of the very high velocity of a small mass to render a ballistic missile or its warhead ineffective. The KEW program contains some of the more mature technology being investigated in the SDI. Efforts include interceptors and hypervelocity gun systems for boost-phase intercept, midcourse intercept, terminal intercept, and defense of space platforms. Both space-based and ground-based kinetic kill vehicles (KKV) are being investigated. The technology thrusts for the space-based KKV include research into a high performance multiple kill vehicle (MKV), fire control/guidance, and booster propulsion. Ground-launched interceptor studies involve both exo- and endo-atmospheric kill. Both space- and ground-based electromagnetic (EM) gun investigations are included. Space-based EM gun investigations include critical technologies such as high-g propulsion, high-g compact structures, long-range high

resolution tracking, and multiple MKV tracking. All of the experiments will be designed and conducted to conform to ABM Treaty constraints.

The Survivability, Lethality, and Key Technologies (SLKT) Program Element provides critical supporting R&T. Understanding the vulnerability of ballistic missiles to the various kill mechanisms is fundamental to assessing their effectiveness against current and responsively hardened targets. Survivability to mission completion, particularly of any defense space assets, is fundamental if defensive options are to be viable. Economical space transportation, on-orbit logistics and maintenance, kilowatt/megawatt sources of power, and multi-megajoule energy storage and conversion are potentially key needs in an affordable defense deployment.

Lethality and target hardening efforts will provide the basic theory underlying kill mechanism/target interactions, the resulting damage and response of the target to damage, and fundamental limitations in hardening countermeasures. The survivability problem includes substantial technology development, particularly in the case of space-based components. It also includes identification and assessment of innovative survivability hardware and tactics and evaluations of the survivability of conceptual designs. Space transportation, logistics, and space power efforts are designed to take advantage of existing DoD and NASA definition efforts and to expand them into the definition phase and satisfaction of the more demanding requirements of a defense-in-depth.

The Systems Concepts/Battle Management Program Element is designed to allow intelligent choices among competing approaches to defense architectures and to develop the technologies necessary to allow eventual implementation of a highly responsive, ultra reliable, survivable, endurable and cost-effective battle management/command, control and communication (C^3) system. Threat analyses, mission analyses, conceptual design of defensive architectures and performance requirements definition, and system evaluation for all levels of a layered defense against ballistic missiles will be performed. The battle management/C^3 efforts will provide the tools, methods, and components (1) for development and eventual implementation of the system and (2) to quantify risk and cost of achieving such a system.

Innovative Science and Technology (IS&T), as the third developmental thrust (identified in Section III E), encourages the innovation of the U.S. scientific community to aid SDI research in identifying new approaches. To this end, the Strategic Defense Initiative Organization is soliciting innovative, advanced technology proposals from small businesses and the academic community.

B. STATUS AND PROGRESS

Many of the ongoing activities within the SDIO are already showing substantial progress. For example, last June, the Army Homing Overlay Experiment demonstrated the capability of a nonnuclear missile to intercept and destroy an incoming warhead outside the earth's atmosphere. Directed energy research devices are already operating at several laboratories. These include a neutral particle beam device at Los Alamos, free electron

lasers at Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and contractor facilities, and chemical and excimer laser devices at contractor facilities. A very high power chemical laser has been installed at White Sands Missile Range. It will be used later this year for lethality and vulnerability experiments. Additionally, progress is exceeding expectations in many areas, including railgun technologies as well as sensors and cryogenic refrigeration devices.

As the initial year was completed, SDIO assimilated existing programs, organized them into groupings of major efforts, and organized the start of some new activities. The FY 1986 program will complete this beginning process. The SDIO is requesting $3.722 billion for expenditures in five program elements consisting of some 73 tasks. A few examples will be cited that characterize the planned FY 1986 activities. The details of the plan are provided in Sections VII through XII.

In Surveillance, Acquisition, Tracking, and Kill Assessment technology the SDIO will:

- Begin to bring on line new capabilities for signature and background collection;
- Initiate important new technology efforts in optics and radar imaging;
- Complete the initial concept definition of several major surveillance demonstrations; and
- Continue the development of advanced architectures for high speed signal processing.

In Directed Energy Weapons technology the SDIO will:

- Continue test of critical, space compatible technologies for space-based lasers (SBL) under three major projects of the space-based laser (SBL) program--a high power hydrogen fluoride (HF) chemical laser ground experiment program called ALPHA, a precision beam sensing cleanup and control program called the large optics demonstration experiment (LODE), and a large lightweight active primary mirror demonstration experiment called the LODE advanced mirror program (LAMP);
- Begin three additional major projects--a major acquisition, tracking, and pointing program, a non-linear HF laser program, and integration experiments utilizing ALPHA/LODE/LAMP along with other hardware components;
- Continue to apply major resources in FY 1986 in advanced technologies applicable to SBL concepts in devices, beam control, large optics and acquisition, tracking, and pointing;
- Complete definition of an initial concept of a fully capable SBL to guide the SBL research efforts and initiate definition of technology development;

- Complete key experimentation of the feasibility of critical components in ground-based laser (GBL) technology;
- Continue experiments to support high brightness, high power short wavelength, excimer and free electron lasers for the SBL concept;
- Continue basic technology development for beam control and propagation from ground transmitters;
- Initiate the development of technology for space relay mirrors;
- Establish neutral particle beam concepts feasibility through experiments using the Accelerator Test Stand;
- Continue theoretical and laboratory experiments designed to prove technologies for beam generation, control, pointing, and propagation; and
- Explore concepts for charged particle beams.

The Kinetic Energy Weapons technology program will:

- Complete initial investigations of the key technologies for the homing payload of an endoatmospheric terminal interceptor and initiate brassboard demonstrations;
- Continue validation of component technologies for exoatmospheric nonnuclear kill interceptors;
- Select hypervelocity launcher technology baselines and complete initial concept design;
- Complete in FY 1986 the initial design and assessment of the requirements on technology for an exoatmospheric reentry vehicle interceptor; define and formally approve a fundamental configuration; and
- Investigate through experimentation the feasibility of integrating guided, high-g tolerant, hit-to-kill munitions in FY 1986.

In Battle Management during this current year the SDIO is establishing baseline requirements and candidate configurations for fault-tolerant computation concepts; developing software methods and tools; developing methods for weapons release and protection against malfunctions; and generating the vast number of algorithms that will be required for a multi-layered, large-scale battle management capability. Efforts in FY 1986 will continue these investigations.

In Systems Concepts, SDIO activities are focused on the development of architectures, models, and simulations. These activities are designed to determine performance and evaluate effectiveness of the SDI technologies in all phases. In FY 1986 the SDIO will begin to evaluate technologies and designs and start detailed analyses of major issues and architectures. The new National Ground Test Facility will support this effort, when completed.

In Survivability, the SDIO is already involved in supporting the architecture and research activities associated with SDI. In FY 1986 they will increase their activity in surveying and assessing on-going work. To develop the whole technology base, projects in passive and active countermeasures work will expand appreciably as candidate concepts are selected for design. These designs could be tested in the coming years. Contracts will also be initiated to stimulate innovative ideas for enhancing systems survivability.

In Lethality and Target Hardening, the SDIO is defining and aligning the various projects in the kill mechanisms of interest--thermal kill lasers, impulse kill lasers, particle beams, kinetic energy kill, and high power microwaves. The goal is to ensure that comparable results will be available on the relative vulnerabilities of targets of interest to these kill mechanisms. In FY 1986 the SDIO will be validating effects models, bringing facilities up to where they are capable of running tests, and performing experiments of specific kill mechanisms on selected materials and structures in specific environments.

In the Nuclear Power task, the multi-organization activity investigating the SP-100 nuclear power subsystem will shift to selection and awarding of a contract to do detailed design work for test articles. The multi-megawatt project will concentrate on a final feasibility decision and the awarding of follow-on studies for approximately six concepts.

In Space Logistics, investigations will concentrate on completion of the examination of both immediate and longer term goals for promising technology to reduce costs significantly.

SECTION VII

SURVEILLANCE, ACQUISITION, TRACKING AND KILL ASSESSMENT (P.E. 63220C)

This program involves research into sensing of information for (1) initiation of the defense engagement and (2) battle management and assessment of the status of forces before and during a defense engagement. The program includes 11 projects and 20 tasks.

A. PROJECT: 0001 - Radar Discrimination Technology and Data Base

	FY 1984	FY 1985	FY 1986	FY 1987
Radar Discrimination Technology and Data Base	24.10	29.90	74.10	98.46
COBRA JUDY		17.10	14.40	31.31
PBV Data Collection		2.70	46.30	53.03
Discrimination Dev & Radar Tech		10.10	13.40	14.12

1. Project Description: This project is composed of three tasks. It is designed to provide radar facilities, measurement equipment, and test targets for the collection of signatures of ICBM components and reentry vehicles, and supports collection and interpretation of the data. The three tasks are:

COBRA JUDY: The COBRA JUDY radar is currently operational and is collecting data.

Post-Boost Vehicle (PBV) Data Collection: An instrumentation radar capable of acquiring data will be developed, fabricated, installed, and operated in this task.

Discrimination Development and Radar Technology: This task will develop and evaluate radar discrimination techniques and will develop advanced radar and signal processing technologies. The primary emphasis in discrimination will be development of techniques. The radar technology effort will advance transmitter and receiver performance and develop advanced phase shifters required by large antennas. Data collected by COBRA JUDY, the PBV Data Collection effort, and other radars will be used to support this task.

2. Program Accomplishments and Plans: Additional automated mission capability was achieved, data collection systems were expanded, and new radar development was initiated in FY 1984.

Data reduction capability is to be completed in FY 1985. Radar fabrication and modification is being completed, and bandwidth is being increased. A radar is being made operational, and a radiometer is being completed. Data collection and processing efforts will accelerate as these capabilities become operational.

In FY 1986, expanded bandwidth operation will begin; data collection, processing, and analysis will continue; and developments will be expanded. The collected data will be used to provide the basis for algorithm development. Future efforts include operation of these data collection capabilities. Data processing and analysis facilities will require monitoring of collections systems. New analysis techniques will be pursued as they are developed, and better methods of utilizing and interpreting data will be examined.

B. PROJECT: 0002 - Optical Discrimination Technology and Data Base

	FY 1984	FY 1985	FY 1986	FY 1987
Optical Discrimination Tech and Data Base	50.50	133.70	198.70	192.31
IR Exo/High Endo Signature Data		95.60	113.80	115.91
Laser Image Data		3.20	28.90	30.85
IR Background Studies		34.90	56.00	45.55

1. Project Description: This project consists of three tasks. They are designed to provide optical facilities, measurement equipment and some test targets for collection of signatures of ballistic missile components and reentry vehicles. The project is also designed to support collection and interpretation of the data. The three tasks are:

Infrared (IR) Exoatmospheric and High Endoatmospheric Signature Data: A data base is necessary in order to design and evaluate optical system sensors. This task provides sensors and platforms to acquire and update this data, the missions to perform the collection, and the subsequent data reduction and analyses.

Laser Image Data: This task will develop a data base on laser imaging. The effort develops a near-term hardware technology base and subsequently collects a data base of measurements taken by an imaging system. Laboratory measurements will precede extensive field tests and eventual collection of data.

Infrared Background Studies: Accurate prediction of IR backgrounds and their effect on target signatures is needed to understand IR sensor performance. This task will develop models and computer codes to predict the spectral, spatial, temporal, and brightness characteristics of the natural background. The background studies will investigate IR emission and absorption under a range of conditions. Data will be collected using field systems and in the laboratory to support model development.

2. Program Accomplishments and Plans: Analysis of data from two major auroral measurement experiments was initiated in FY 1984. These experiments are called Earth Limb Infrared Atomic Structure (ELIAS) and the Field Widened Interferometer (FWI) provided data. Rocketborne hardware development and design were completed, and preliminary flight tests without the sensor were begun. Aircraft support facilities were completed.

In FY 1985, experiments are acquiring the first data and making comprehensive measurements. This information on natural variability and auroral excitation will support modeling. Additional flights are being launched to complete a data base, and a reflight in daylight conditions is being scheduled.

Development will continue in FY 1986, and an engineering test will be conducted. Development of a laboratory simulator to verify sensor performance will be initiated.

C. PROJECT: 0003 - Imaging Radar Technology

	FY 1984	FY 1985	FY 1986	FY 1987
Imaging Radar Technology	6.30	15.30	45.80	122.96
Large Array Technology		9.40	27.80	66.46
Near-Term Imaging Demonstration		5.90	8.00	4.64
Satellite/Aircraft Imaging Radar			10.00	51.86

1. Project Description: This project is comprised of three tasks. It is designed to pursue the requisite technology for demonstrating radar imaging in real-time in order to discriminate among reentry vehicles, decoys, and other components of ICBM systems. Radars can provide cross-section history, precision metrics to monitor kinematics, and coherent range, cross-range images. During midcourse, further discriminations may be possible through radar observations and measurements of characteristic signatures. Radars may also be valuable for discrimination of reenty vehicles from sophisticated decoys just prior to and during reentry.

Large Array Technology: This task is directed toward the development and demonstration of key technologies for large phased-array imaging radars. Development of various radar items will be a major portion of the task.

Near-Term Imaging Demonstration: This task provides the hardware and software necessary to implement and demonstrate high frequency radar systems. Initially, sufficient hardware and software will be developed and implemented in a simulation facility. This simulation will be capable of playing back data recorded by other sources. After successful demonstration of the imaging capability in the simulation facility, the hardware and software will be expanded so that operational measurements can be made at an existing radar facility.

Satellite and Aircraft Imaging Radar: Under this task, technologies developed under other tasks, principally Imaging Algorithm Development, Large Radar Array Technology, and Real-Time Signal Processing, will be integrated with consideration given to various radars for demonstration of this concept.

2. Program Accomplishments and Plans: In FY 1984, the antenna concept was defined considering factors such as weight, storability, on-orbit deployment, module cost and weight, and ease of fabrication. In FY 1985,

antenna material is being selected. Test samples of moderate sizes are being built, and structural/electrical and thermal/vacuum tests are being conducted. Demonstrations are also being performed.

Testing efforts will continue in FY 1986, and a technology base program to develop advanced items will be initiated.

D. PROJECT: 0004 - Imaging Laser Technology (Optical)

	FY 1984	FY 1985	FY 1986	FY 1987
Imaging Laser Technology (Optical)	5.60	28.30	127.00	188.75
Large Optics Technology		8.40	23.00	22.27
Laser Imaging Technology		10.90	71.00	99.96
Imaging Laser Measurements		9.00	28.00	38.80
Early Demonstration of Angle-Only Tracking			5.00	27.72

1. Project Description: This project is comprised of four tasks. It is designed to perform research on concepts of future electro-optical imaging capabilities. The four tasks include:

Large Optics Technology: A comprehensive program of technology development is required to make possible the wide variety of large optics required in some concepts. Technology must be developed and demonstrated that allows production of very large, very lightweight, and very precise optics. Such optics will have to operate at cryogenic temperatures and have the ability to reject stray radiation even when the source is very close to the target. The optics must be manufactured at a high rate to allow deployment of a constellation in a timely manner. This task is divided into five principal subtasks: precision polishing, active/segmented mirrors, off-axis rejection, rapid fabrication, and metal mirrors.

Laser Imaging Technology: This task will develop technologies required for the construction of components of laser transmitters and receivers. A vigorous program will be undertaken to confirm technical feasibility. Emphasis will be placed on discrimination. Potential countermeasures will be identified and their effectiveness addressed. This task will be supported by, and proceed in parallel with, the Imaging Laser Measurements task.

Imaging Laser Measurements: A continuing program of measurements and demonstrations must accompany the Laser Imaging Technology task development. The objectives include verification of sensor concepts and parameters assumed in initial design studies and acquisition of optical data. Data will be gathered through the use of existing material measurement capabilities, ground test chambers, and new flight-test platforms.

Early Demonstration of Angle-Only Track: This task will provide data and explore issues related to midcourse acquisition, tracking, discrimination, and designation. Alternative approaches are being considered for this task which is still in its infancy.

2. Program Accomplishments and Plans: An initial effort in this project in FY 1984 was development of ultra-lightweight optics and assessment of procedures to produce them. Promising computer-controlled polishing techniques were investigated to scale-up machines capable of working large surfaces. Stable laser oscillator studies were performed leading to several possible constructions, and different techniques were investigated.

Starting in FY 1985, this project draws on and continues existing technology base activities. A small number (two to four) of rapid optics fabrication efforts are being selected for demonstration at medium scale. Work is being initiated to develop appropriate algorithms for this work.

Rapid optics fabrication efforts will be focused in FY 1986 into a demonstration at medium scale. The project will integrate fundamental technologies and conduct subsystem demonstrations required to make technical feasibility decisions. Initial parallel efforts will result in down-selection to engineering development of the one or two most promising approaches, and the measurements program will verify sensor design parameters.

E. PROJECT: 0005 - IR Sensor Technology

	FY 1984	FY 1985	FY 1986	FY 1987
IR Sensor Technology	86.80	57.80	151.40	157.83
Optics Technology		16.90	54.40	55.01
IR Focal Plane Development		20.40	64.00	66.70
Space Cryocoolers		20.50	33.00	36.12

1. Project Description: This project is made up of three tasks. Under it there will be research on the technologies associated with advanced IR focal planes for various surveillance, acquisition, tracking, and kill assessment systems. The primary emphasis is directed toward passive IR systems; however, a number of technologies are generic and will support other areas as well. The tasks will develop all critical technologies to support the design and development of high performance optical sensors, detector materials, associated electronics and integrated focal planes, and high efficiency, long-life cryogenic refrigeration systems.

Optics Technology: This task will establish the critical technologies needed to design and develop high performance optical sensors. Key efforts include: development of technology for wide field-of-view optical systems; development of large, high-quality, passive optical sensors; conceptual design of high-performance optical sensors; development of large arrays of nuclear-hardened detectors; development of signal processing algorithms and hardware to support the large detector arrays; development of sensor calibration and test facilities; and development of techniques to allow production of these components in quantity.

IR Focal Plane Development: Development of detector and multiplexer materials for integration into IR focal planes having large array size will be accomplished in this task. The work is being performed in two

broad classes of detectors. The task will also develop electronics required to interface with these arrays and the pilot production processes needed for manufacturing large quantities of these items.

Space Cryocoolers: The objective of this task is to develop long-lifetime, high-efficiency, spaceborne cryogenic refrigeration systems. The task is divided into two segments. One is continuing and extending existing cryocooler technologies. This effort will consider several approaches offering increased efficiency, lower operating temperatures and longer lifetimes. The second subtask considers new concepts, such as magnetic ordering and disordering for coolers with higher efficiencies.

2. Program Accomplishments and Plans: Some elements for IR sensors were tested in FY 1984 under operational conditions. Others were tested to determine vulnerability and survivability. Signal processing techniques were demonstrated. The surveillance and tracking system focal plane technology program was continued with competitive awards of the system program and the focal plane technology program. Contracts were augmented for focal plane development and for material development. Development efforts were augmented and test facility upgrades begun. Candidate machines entered performance/life testing.

A one-of-a-kind facility is being used to evaluate the state-of-the-art devices, and advanced concepts are being vigorously pursued. Development of a simulator-based evaluation testbed to measure the performance of new sensor architectures is being initiated. Increased efforts are being conducted to accelerate the development of longer lived, flight-capable refrigerators to support SDI requirements. Efforts on detector arrays and their associated cryocoolers will be continued in FY 1986.

F. PROJECT: 0006 - Boost Surveillance and Tracking System (BSTS) Experiment

	FY 1984	FY 1985	FY 1986	FY 1987
Boost Surveillance and Tracking System Experiment	28.30	38.00	131.10	302.91

1. Project Description: This project pursues the technical research necessary for a near real-time, fully responsive experiment. The program includes system concept definition efforts and development/validation of critical sensor and data processing components associated with these concepts. The capability to satisfy additional missions will also be evaluated. This project is designed to satisfy SDI requirements as well as the needs specified in the Office of the Secretary of Defense Master Plan for Ballistic Missile Tactical Warning/Attack Assessment provided to Congress in 1981.

2. Program Accomplishments and Plans: Four concept definition efforts were started in FY 1984 to develop competitive approaches for survivable, endurable, and cost-effective experiment options. These efforts will provide a range of specific system designs; technology assessment and development planning; system transition plans; and life-cycle cost estimates for all options. In parallel, technology risk reduction efforts are underway.

The FY 1985 effort is concentrating on developing, assessing, and selecting the appropriate concept for experimental verification. The concept definition efforts are designing subsystems. The experiment definition efforts are being completed and evaluated. Further risk reduction efforts are being conducted. A concept selection decision is being conducted to review technical approaches and to start demonstration and development of the experimental system.

In FY 1986 a preliminary concept selection decision will be made, an experimental demonstration program will be initiated, and further risk reduction efforts will be conducted.

G. PROJECT: 0007 - Space Surveillance and Tracking System (SSTS) Experiment

	FY 1984	FY 1985	FY 1986	FY 1987
Space Surveillance and Tracking System Experiment	35.60	37.00	136.00	267.13

1. Project Description: This project pursues research in space surveillance. These research efforts are specifically oriented toward the requisite technology. The primary activity in this project is concept definition and preliminary research.

2. Program Accomplishments and Plans: Three concept definition efforts were started in FY 1984 to develop competitive approaches for survivable, endurable and cost-effective experiment options. These efforts will provide: a range of specific system designs; technology assessment planning; system transition plans; and life-cycle cost estimates for all designs. In parallel, technology risk reduction efforts are underway.

Fiscal year 1985 efforts are concentrating on developing, assessing, and selecting an appropriate concept for this experiment. These concept efforts are defining the midcourse surveillance and tracking system experiment. Further risk reduction efforts are being conducted. A concept selection decision is being conducted to review system technical approaches and to start demonstration of a survivable space surveillance and tracking system experiment.

A preliminary concept selection decision will be made in FY 1986, and an experimental demonstration program will be initiated on a survivable midcourse surveillance and tracking system. Further risk reduction efforts will be conducted. The utility study of the alternate/advanced concepts, associated technology requirements, and potential technology issue resolution programs will be completed.

H. PROJECT: 0008 - Optical Surveillance Experiment

	FY 1984	FY 1985	FY 1986	FY 1987
Optical Surveillance Experiment	28.80	117.00	191.64	167.98

1. Project Description: Research for this project will investigate the feasibility of an optical sensor system. An experimental device will be tested under this project to demonstrate the technical feasibility of using optical sensors on an airborne platform.

2. Program Accomplishments and Plans: A request for proposals was prepared and issued in FY 1984. An experimental demonstration contract was awarded. Requirements were determined and apportioned to subsystems, and the design of those subsystems was initiated.

In FY 1985, experiment and subsystem design are being completed and fabrication begun. Integration, test, and evaluation plans are being completed, and target support equipment specifications are being initiated.

In FY 1986, the experiment will be analyzed for design feasibility, requirements traceability, and interface definition and specification. Subsystem design trades and subassembly performance analysis will be performed to finalize drawings for the experimental program.

I. PROJECT: 0009 - Terminal Imaging Radar Experiment

	FY 1984	FY 1985	FY 1986	FY 1987
Terminal Imaging Radar Experiment	100.50	6.00	74.60	93.00

1. Project Description: The objective of this project is to develop a fixed ground-based track and imaging radar.

2. Program Accomplishments and Plans: In FY 1985, critical subsystems and components were tested.

Competitive Concept Definition Studies will be completed in FY 1986 with contractors delivering their proposed radar specification and software requirements. Two of the contractors will be selected to continue detailed design to assure that the selected design is in accordance with the end-item specification. Fabrication and integration will be performed. Acceptance tests will be conducted at the contractor's facility, and installation will be performed.

J. PROJECT: 0010 - Space-Based Imaging Experiment

	FY 1984	FY 1985	FY 1986	FY 1987
Space-Based Imaging Experiment			5.80	11.09

1. Project Description: This project pursues the research for a space-based imaging experiment. Although the gathering of data to permit assessment will reside in other SATKA projects, this project will compare the efficiency of various approaches. Each approach has peculiar attributes and each requires advances in technology. The best choice will not be evident without further research.

2. Program Accomplishments and Plans: Concept definition efforts will be initiated to develop a survivable, enduring, and cost-effective system experiment. This effort will provide a range of specific options, technology assessment and development planning, transition plans, and life-cycle cost estimates. The FY 1986 effort will concentrate on assessing and selecting the appropriate imaging sensor for the experiment.

K. PROJECT: 0011 - Common Technology and Architecture

	FY 1984	FY 1985	FY 1986	FY 1987
Common Technology and Architecture		82.95	250.20	272.50
SATKA Systems Studies		17.15	49.00	43.70
Imaging Algorithm Development		3.00	9.50	14.71
Radiation Hardened Circuits		33.40	99.80	114.89
Real-Time Signal Processing		29.40	91.90	99.20

1. Project Description: This project is designed to develop technologies common to surveillance,acquisition, tracking, and kill assessment (SATKA). The project tasks include the development of imaging algorithms, the achievement of radiation-hardened circuits and implementation of real-time signal and data processing techniques. The project also includes a studies task that addresses trade-offs and utility of the various sensor designs under consideration.

SATKA Systems Studies: The objective of this task is to define, perform, and update systems level analyses in support of other SATKA tasks. The efforts accomplished in these analyses will: examine alternate sensors in light of evolving technologies, improved understanding of underlying phenomenology, and maturing perception of costs and cost trade-offs; examine the impact of survivability on the choice of sensor components; and assess the interface required between various sensors and between the sensors and other elements of the overall defense.

Imaging Algorithm Development: Current techniques for imaging potential targets depend upon human intervention to provide the best estimates of target motions. This task will develop and demonstrate algorithms that will assess target motion and form images based upon these initial assessments. The algorithm development will provide data necessary to judge the relative efficiency of each system type. The task is further broken down into four subtasks: (1) Concept Exploration, (2) Algorithm Coding, (3) Simulation Development, and (4) Simulation.

Radiation-Hardened Circuits: To accomplish various mission objectives during hostilities, key performance elements must survive in the presence of high levels of nuclear radiation. Particularly, electronic circuits and memories must be developed to very high levels of hardening. This project will establish needed technology. Initial efforts will focus on materials technology and manufacturing processes. Later phases will include brassboard demonstrations and technology insertion efforts.

Real-Time Signal Processors: This task will develop processing systems capable of supporting the sensors developed in other tasks.

Emphasis will be on systems that can meet requirements, operate autonomously, be fault-tolerant, and be capable of system reconfiguration. A technology program has been defined that will generate a technical base, perform research leading to fault-tolerant architectures, and develop of advanced algorithms for high-speed data processing. Early thrusts will be completion of an advanced on-board signal processor, an advanced distributed on-board processor, and a dynamically reconfigurable processor.

2. Program Accomplishments and Plans: Work on technology continued in FY 1984.

An effort to obtain a family of computer chips is near the test and evaluation stage. Pilot lines will be added in FY 1985 for some devices, and some reliability and radiation testing will be performed. Development of a simulator-based evaluation test bed to measure the performance of new sensor architectures is being initiated.

Fiscal year 1986 work continues the basic developments initiated earlier. During FY 1986, work will begin on specific areas to demonstrate technology needed for specific SDI applications. Algorithms for high-speed signal processing will be completed and demonstrated. The development of advanced computing architectures which support experimental demonstration programs and technology base efforts to meet advanced SDI requirements will continue.

SECTION VIII

DIRECTED ENERGY WEAPONS TECHNOLOGY (P.E. 63221C)

This program provides development and demonstration of technology required for directed energy weapon concepts for boost and post-boost phase intercept for defense against ballistic missiles. The program includes 4 projects and 28 tasks.

A. PROJECT: 001 - Space-Based Laser (SBL) Concepts

	FY 1984	FY 1985	FY 1986	FY 1987
Space-Based Laser Concepts	157.00	162.70	371.90	507.70
Devices		5.52	18.00	41.10
Beam Control		4.10	18.30	34.30
Large Optics		4.40	11.10	21.20
ATP Technology		8.18	37.10	69.10
Major Experiments		120.40	179.80	234.00
Space ATP Support			80.00	80.00
Concept & Development Definition		7.00	20.60	28.00
Innovative Science and Technology		4.80	7.00	TBD
Other Technology		8.30	-	-

1. Project Description: This project and its nine tasks contain the redirected technology development activities of the Space Laser Program originally described to Congress in the 1982 "DoD Space Laser Program Plan." It is designed to demonstrate the feasibility of the major subsystems of a space-based chemical laser to engage ballistic missiles. In addition, it pursues technologies to provide the performance growth required in an evolving offense-defense interaction. The primary candidate for achieving these performance levels is a concept that allows fabrication and deployment of systems capable of defeating threats of interest and growth in performance to meet a threat hardened to directed energy weapon (DEW) radiation. Additional longer term device concepts, such as short wavelength chemical and free electron laser candidates suitable for space-basing, are also under investigation. As the technology matures, initial capabilities in other strategic defense mission areas (antiaircraft and antisatellite) can be spun-off into other development activities if such applications prove to be cost-effective.

SBL Technology Development tasks included in this program are designed to: (1) establish component technologies required for performance growth of space-based laser deployments, and (2) maximize the yield of technology outcomes not only for the SBL thrust but also for the other thrusts of the Strategic Defense Initiative (SDI). These tasks include:

- Laser Device Technologies which explore enhanced chemical laser performance, short wavelength chemical lasers, etc;

- Beam Control Technologies which explore telescopes, advanced sensors and processing techniques for beam clean up; alignment systems for high power beams, etc;

- Large Optics Technologies which explore optical components and coatings; fabrication technology; large space mirrors and the technology to rapidly fabricate them, etc.; and

- Acquisition, Tracking, and Pointing (ATP) and Fire Control Technologies which explore advanced ATP components, advanced fire control sensor techniques, large structure technology, etc.

Not included in this project are the basic technologies for free electron lasers, also a candidate for space-basing, which are under investigation in project #002, Ground-Based Lasers.

Major Experiments include a series of experiments on the key technologies ultimately needed for an operational weapon--the laser device or beam generator (ALPHA), beam control (Large Optics Demonstration Experiment - LODE), and large optics (Lode Advanced Mirror Program - LAMP), and a newly constituted acquisition, tracking, and pointing demonstration program designed to replace Talon Gold. LODE and LAMP also support the other directed energy projects in this program element by providing the major part of the generic technology needed for those concepts. The objective of the ALPHA program is to develop the technology for chemical lasers which, in a configuration designed for space operation, can generate near diffraction-limited beams with high efficiency. The LODE and LAMP will demonstrate critical beam control and optics technology. The newly constituted acquisition, tracking, and pointing demonstration program will concentrate on a series of experiments that will demonstrate, with increasing degrees of difficulty, all elements and technologies required for space- and ground-based lasers as well as kinetic energy weapons and space-based surveillance. The mutual interactions of the various components of a high energy laser weapon system will be investigated under the high power integration technology project. In the first phase, generic experiments will investigate interactions utilizing the chemical laser at White Sands Missile Range. In a later phase, another generic chemical laser integration experiment is planned utilizing technologies of the type being developed for space-based chemical lasers (e.g., ALPHA & LODE/LAMP hardware).

Space ATP Support funds the interface equipment and the common payload orientation system and mechanical interfaces to be used in planned space experiments. These experiments are designed to: collect background and target signature data at multiple wavelengths; assess designation capabilities; and perform precision acquisition, tracking, and pointing tests.

Concept and Development Definition (CDD) supports the entire project by defining the technology development and demonstration plans to resolve critical DEW issues. To achieve this, three interrelated CDD tasks will be pursued: (1) concept definition for technology identification -

synthesize and evaluate concepts, allocate performance and provide requirements flowdown, perform supporting trade studies and technology assessment and planning, (2) demonstration definition - define, price, and schedule the ground and space demonstrations to validate critical technologies, and (3) operational weapon concept definition - provide the conceptual design of an operational system as a source of additional technology guidance and as a common base for interaction with the System Architecture Studies.

2. Program Accomplishments and Plans: Major subsystem experiments are emerging. The broad technology base development activity under this project provides technologies that benefit other directed energy weapons programs.

SBL Technology Development efforts in FY 1984 were a mix of continuation of activities established in the early 1980s, some existing programs reoriented to SDI needs, and some new efforts. Device Technology efforts included continued pursuit of high efficiency nozzle designs, investigation of large optics fabrication techniques and associated metrology instruments, and the identification and formulation of plans for promising new short wavelength chemical lasers. Beam Control efforts continued development of high performance sensors. Large Optics efforts completed the carbon-carbon materials program and demonstration of the applicability of carbon-carbon technology to large space optics. Efforts to develop mirror coatings for silicon mirrors continued. Acquisition, Tracking, and Pointing efforts included initiating development of a retargeting simulator, selecting a real-time laser damage assessment concept and continuing the ATP issues investigation. Major Experiment activities continue to be focused on a demonstration of the critical elements of SBL weapon technology. The ALPHA program has completed its initiation activities and modifications to the test facility. In the LODE Advanced Mirror Program (LAMP), design activities were concluded. The LODE program continued design activities focused on meeting the beam control requirements. The Talon Gold program, after considerable high level review, was placed on hold pending a detailed review of acquisition, tracking, and pointing requirements for the entire Strategic Defense Initiative. Components of the generic integration experiment continued to be investigated throughout FY 1984. Modifications to the chemical laser at White Sands Missile Range were in progress. In Concept and Development Definition, efforts begun under the 1982 Space Laser Program Plan to develop a concept for a multi-mission SBL deployment were completed. For Phase II of the effort (to begin in FY 1985) the contractors were instructed to focus on concepts for the weapon platform only and to examine concepts for the requirement of SBLs for use in defense against ballistic missiles only.

FY 1985 Technology Development efforts in Device Technology are investigating potential means of scaling to high brightness levels. These efforts continue enhancement of the performance of chemical laser nozzle concepts with the goal of increasing the efficiency of laser energy extracted per gram of reactant used. In Beam Control, investigation of concepts for rapid retargeting of high-power beams are being accelerated. Development of technologies for sensors and beam-sampling concepts such as holographic grating elements is continuing. Also in 1985, conceptual definition of a mirror system is being completed. In Large Optics, the development of advanced technologies and materials is beginning. The development

and test of advanced cooling concepts for mirrors under very high radiation loads is continuing. Acquisition, tracking, and pointing technology efforts are being initiated for the rapid retargeting simulator along with complementary efforts in the area of advanced digital control techniques.

FY 1985 activities in the Major Experiments area include the ALPHA I chemical laser gain generator, the facility, and the full-scale optics demonstration unit (FSDU). The large optics demonstration experiments are continued as is the advanced mirror program. The Large Optics Diamond Turning Machine (LODTM) program is beginning fabrication, testing, and installation of metrology instrumentation. Concept and Development Definition (CDD) activities in FY 1985 are developing weapon platform concepts with the purpose of identifying the technology content of the weapon segment and its interfaces with other major system segments in a space-based laser deployment for defense against ballistic missiles. Also in FY 1985, CDD is defining the statement of work for efforts expected to begin in FY 1986 that will define concepts for later demonstrations.

In FY 1986 device technology efforts will complete the concept definition for an advanced infrared (IR) chemical laser. Free electron laser (FEL) and short wavelength laser technology development continues. Beam control efforts continue work on concepts for rapid retargeting, innovative wavefront sensors, and high-power, aperture-sharing components. Large optics technology efforts include: a high-quality demonstration segment; precision polishing and metrology of large mirrors for space-based laser performance requirements; Zerodur fabrication processes; advanced cooled mirrors; and high-power hydrogen fluoride (HF) coatings for space-based laser optics. Acquisition, Tracking, and Pointing efforts include brassboard experiments and analysis activities. Work on the rapid retargeting simulator will continue. Major Experiments: Experiments designed to explore the mutual interaction of components of a high energy laser weapon system will be conducted. The design of the hydrogen fluoride (HF) integration experiment will be completed. Concept and Development Definition activities will complete the technology identification effort and initiate definition of the required demonstrations.

In the fiscal years beyond FY 1986, the Device Technology effort will continue to investigate free electron laser (FEL) and short wavelength chemical laser technology as candidates for space-based laser concepts. High efficiency nozzle designs will be evaluated to select the most promising concept. This concept will be fabricated and tested in a high power device. Beam Control activities will complete concept definition studies for beam control and tracking; will demonstrate wavefront control; will complete an innovative wavefront sensor and a high-power, aperture-sharing component; and will perform experiments with agile pointing sensors. Performance models and experimental data bases will be available by the end of the decade. Large Optics Techniques for improved numerically-controlled surfacing and advanced process control metrology will be developed and employed to produce a segment of a large primary mirror. Brassboard testing of this segment will validate large optics performance. Experiments with a high actuator density mirror will be completed. Advanced materials and processing steps for improved substrates for a high actuator density test

article will be validated. Advanced materials and techno ies for high-power mirrors to satisfy requirements for a space-based laser will be explored. Representative mirrors will be fabricated and their thermal distortion performance fully validated. Deposition processes and materials for high-reflectance coatings for space-based chemical lasers will be investigated. The most promising option will be selected and used to coat the advanced mirrors. Coating performance will be validated. Large optical structures will demonstrate the required structural control tolerances. Innovative approaches for chemical laser devices will be assessed and subsequent experiments planned. Acquisition, tracking, and pointing technology efforts will continue. Advanced sensor hardware for active tracking and inertial reference will be developed. Fire Control technologies will be advanced. Major Experiments: The ALPHA HF chemical laser device feasibility will be established. The LODE Advanced Mirror Program (LAMP) and Large Optics Demonstration Experiment (LODE) beam control technology demonstrations will be completed. Testing of the mutual interactions of the various high-power components will be completed. Concept and Development Definition will complete the weapon platform definition by providing an operational system concept to support a program review. Also, to support this review, design concepts for advanced demonstrations will be available.

B. PROJECT: 0002 - Ground-Based Laser (GBL) Concepts

	FY 1984	FY 1985	FY 1986	FY 1987
Ground-Based Laser Concepts	133.10	178.15	431.54	455.20
Laser Devices		82.05	110.60	95.00
Ground Segment Beam Control		66.12	99.00	103.00
Space Segment		2.00	32.00	67.00
Major Experiments		4.13	149.24	150.00
Concept & Development Definition		5.00	19.70	25.20
Innovative Science and Technology		5.20	10.50	TBD
Other Technology		13.65	10.50	15.00

1. Project Description: The seven tasks of this project provide the technology base, demonstrations, and designs required to provide a firm basis for deciding whether or not to pursue a ground-based laser weapon for boost-phase intercept. This project will establish and demonstrate the major subsystems for this ground-based laser concept at visible/ultraviolet (V/UV) wavelengths. There are three main thrusts: Technology Development, Major Experiments, and Concept and Development Definition.

Technology Development contains the first three tasks--major device efforts (excimer and free electron lasers), ground segment telescope development, and space segment relay mirror definition and development along with associated visible/ultraviolet optics technology development. The project shares developments in components, large optics, beam control, and acquisition, tracking, and pointing technology with the space-based laser project. Investigations of free electron laser (FEL) technology for use as a space-based, short wavelength laser are included here with the other FEL tasks rather than in the space laser project. Finally, the project provides the resources necessary to investigate new and innovative

concepts that promise major increases in short wavelength subsystem performance.

Excimer laser devices operate at wavelengths in the near-ultraviolet region of the spectrum. They are likely to be limited by size, weight, and efficiency considerations to being ground-based systems. There are two device candidates being pursued in this excimer program.

Free electron lasers (FEL) operate by interacting high energy electron beams with magnetic "wiggler" fields to convert the kinetic energy of the electron beam into optical radiation. By recovering the unexpended energy of the electron beam, high laser efficiencies may be possible. Because of their wavelength selectability and relatively high electrical efficiency, FEL devices are promising candidates for both ground- and space-based platforms. This project will establish the feasibility of scaling to the required power levels with good beam quality and high electrical efficiency.

In the ground segment technology development efforts, Beam Control and acquisition, tracking, and pointing technology will be pursued. This segment of the ground-based laser system must correct for the optical aberations in the beam.

Space segment technology development efforts include concepts for the relay mirrors which reflect the beam transmitted from the ground station and the mission mirrors which receive the relay of the beam and focus the beam on the target. Surfaces of mirrors must be figured (shaped to) within a small fraction of a wavelength. The rapid retargeting times needed require new concepts. Mirror coating techniques must maintain ultraviolet (UV) quality over a wide variety of incidence angles. All mirrors require mirror figure control to a fraction of a wavelength. The most stressing acquisition, tracking, and pointing requirement for all potential directed energy weapon systems are associated with the low earth orbit mission mirror. The target must be accurately tracked, inertial motion sensed, and the beam positioned. Cooperative tracking to the other (relay mirror) components of the system must also be maintained to this level. Aperture sharing techniques must be developed.

Major Experiments are planned which integrate related elements of the technology development into major demonstrations of device, ground segment, and space segment technology. Excimer and FEL devices will be demonstrated and integrated with a beam director.

Concept and Development Definition supports the entire project by defining the technology development and demonstration plans to resolve critical DEW issues on a scale that establishes technical feasibility of realizing weapon level performance. To achieve this, three interrelated CDD tasks will be pursued: (1) concept definition for technology identification --concept synthesis and evaluation, performance allocation and requirements flowdown, supporting trade studies and technology assessment and planning, (2) demonstration definition--define, price and schedule the ground and space demonstrations to validate critical technologies, and (3) operational weapon concept definition--provide the conceptual design of an operational

system as a source of additional technology guidance and a common base for inputs needed in the System Architecture Studies.

2. Program Accomplishments and Plans: Building on (1) prior technology efforts in short wavelength beam generators, (2) a potential to improve beam quality and beam power, and (3) initial successes in beam control, the ground-based laser program is moving toward major decision milestones designed to demonstrate readiness to proceed.

In Technology Development, excimer laser technology development passed important milestones in FY 1984. Demonstrations of the critical components continued to be expanded. Source selection was initiated and completed for one concept. Plans for the other were nearing completion but were placed on hold due to funding limitations and a pending redefinition of the approach. Component experiments continued, yielding progressively improving outputs and efficiencies. The technology development efforts for radio frequency linear accelerator driven, free electron lasers were continued. A preliminary program to establish the feasibility of using induction linear accelerators, such as the Advanced Test Accelerator (currently being built under a non-SDI program) for high power, free electron lasers was defined. Initial experiments conducted on the Advanced Test Accelerator have shown promise. In the ground segment activities, experiments that predate the SDI were continued. Technology efforts were initiated to build the necessary adaptive optics and wavefront sensors. Computer simulation of relay systems has shown development paths for the most significant performance payoffs. Inertial elements for stabilization have been demonstrated.

In FY 1985, the major thrusts of the ground-based laser activities (1) continue preparations for major demonstrations and (2) initiate the new activities described in the approved plan.

Technology Development: The excimer laser program in FY 1985 is completing experiments in xenon fluoride (XeF) lasers with Raman beam quality improvement. Critical technology experiments are being completed and hardware experiments have begun. An upgrade of the electron beam quality of the Advanced Test Accelerator is being undertaken and free electron laser experiments are being conducted. Experiments designed to demonstrate electron beam energy recovery in a free electron laser are underway and resonators for high power FELs are being tested. Key beam control experiments are being completed. Evaluation of adaptive optics components are also being completed. Efforts will begin on technology developments for advanced adaptive optics. In large optics, a preliminary look at space relay mirrors is being initiated to verify the relevance of planned technology development. Acquisition, tracking, and pointing and inertial sensing technology tasks are being initiated.

In Major Experiments, design activities are being initiated to define the proper experiment to resolve the remaining physics issues.

Concept and Development Definition will be initiated late in FY 1985 with a multiple contractor concept definition of a ground-based laser boost-phase intercept system designed to identify technology needs and ensure the relevance of the technology development program.

In FY 1986, a major thrust will be the excimer laser demonstrations. Source selection activities for the second device type will be initiated early in the year. Prior to selection, all of the technology components will have been tested. The free electron laser program will continue to investigate high gain FEL operation on the Advanced Test Accelerator. Experiments to support scaling to shorter wavelength FELs will be completed. The design of a free electron laser test bed using either a radio frequency or induction linear accelerator will be based on these experiments. Issues of the associated beam control for both the FEL and excimer laser will be addressed. Space segment technology efforts will continue to focus on concepts and components. Advanced technology for space segment systems will investigate beam transfer through relay systems, and innovative tracking systems. Technology demonstrations to support the ground and spaceborne experiments are scheduled. Work on adaptive optic components will continue. Concept and Development Definition activities will initiate the design/definition. Concept definition for technology identification will be completed in FY 1986.

In the years beyond FY 1986, Technology Development activities will continue to experiment with free electron laser designs. Parallel to these experiments additional technology development will support the efforts. Technology development activities in excimer lasers and the ground segment will continue until feasibility is established. Optical component technology development will ensure the necessary optics subsystems are available for use in all the other efforts. Innovative concepts for ground segment beam control will be investigated. The development of the space segment will proceed to proof-of-principle.

Design efforts for optical segments will be started and multiple mirror segments will be delivered for use in subsystem experiments. Wavefront sensing and control technology will concentrate on high bandwidth/high precision measurement techniques. Low noise, control moment gyro technology will be addressed in joint retargeting experiments with the space-based laser effort. The acquisition, tracking, and pointing effort will begin the fabrication of a test facility to support key experiments in critical functional areas.

Major Experiments will continue the development of the excimer laser. Accompanying the device development, ground segment experiments will continue.

Concept and Development Definition activities will parallel the technology development efforts providing them with the technology development and definition plans to guide these efforts. Three interrelated efforts are planned: (1) concept definition for technology identification, (2) system level definition, and (3) operational weapons concepts definition.

C. PROJECT: 0003 - Space-Based Particle Beam (SBPB) Concepts

	FY 1984	FY 1985	FY 1986	FY 1987
Space-Based Particle Beam Concepts	13.90	32.15	133.40	184.00
Neutral Particle Beam (NPB)		20.60	74.00	89.00
Antigone		7.00	29.00	31.00
Advanced NPB Concepts			2.00	15.00
Integrated NPB Experiments			13.60	35.00
Concept & Development Definition		2.90	7.80	14.00
Innovative Science and Technology		1.00	7.00	TBD
Other Technology		0.65	-	-

1. Project Description: This project is comprised of six tasks. It is designed to provide for the development of particle beam technology for a space-based, boost/post-boost intercept system. The primary thrust of the program is focused on demonstrating the feasibility of space-based neutral particle beams (NPB) by demonstrating: (1) beam generation/conditioning with an accelerator, (2) lightweight magnetic optics that can steer the beam, (3) concepts for the acquisition, tracking, and pointing (ATP) subsystem, (4) divergence maintained in the environment in and around a spacecraft containing a particle beam device, (5) the feasibility of growth technology that can provide higher brightness beams, and (6) integration of key subsystems of a space-based NPB weapon.

In the NPB Technology Development portion of the program, the Accelerator Test Stand (ATS) is the major experiment demonstrating the scientific feasibility of ion beam production and acceleration. It currently consists of a pulsed negative ion source, a low energy beam transport system, and a low energy accelerator--the radio frequency quadrupole (RFQ). The ATS currently produces a beam energy out of the RFQ; however, the addition of the drift tube linear accelerator (DTL) will boost the output energy of the beam. After the completion of initial demonstrations, work will commence on the Accelerator Test Stand Upgrade (ATSU). The ATSU will evolve from the ATS by a series of upgrades that will demonstrate operation and control, as well as providing a test bed for evaluating new high brightness concepts. It would consist of a continuously operating negative ion source, a low energy beam transport system, a radio-frequency quadrupole accelerator, a high energy drift tube linear accelerator, magnetic optics for beam transport and pointing, and a beam neutralization system. The system will produce a neutral beam. A parallel effort will examine the potential for producing neutral particle beams with a higher brightness. This technology development effort involves, among other things, the development of ion sources and the investigation of laser beam cooling. In order to control the beam size at the target, a magnetic lens is required at the output of the system. It is, in fact, a magnetic version of a laser's beam-expanding telescope. Efforts in this area will develop a magnetic field beam-expander telescope, a steering magnet for an exit beam, and lightweight magnetic technology for space application. The large magnetic optics will be integrated in the Accelerator Test Stand Upgrade (ATSU).

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Advanced NPB Concepts provide the resources to examine innovative approaches to high brightness, high efficiency, and lightweight concepts for space-based particle beams.

Beam Sensing and Control: A key technical issue associated with pointing and tracking neutral particle beams centers on sensing the position of the beam and establishing a reference ("boresight") between the beam's direction and the axis of the weapon tracking system. Two concepts will be investigated.

Concept and Development Definition supports the entire project by defining the technology development and demonstration plans to resolve critical space-based particle beam issues. To achieve this, three interrelated CDD tasks will be pursued: (1) concept definition for technology identification--concept synthesis and evaluation, performance allocation and requirements flowdown, supporting trade studies and technology assessment and planning, (2) demonstration definition--define, cost and schedule the ground and space demonstrations to validate critical technologies, and (3) operational weapon concept definition--provide the conceptual design of an operational system as a source of additional technology guidance and a common base for inputs needed in the System Architecture Studies.

The remaining portion of the space-based particle beam program is focused on the investigation of advanced concepts. Currently there is one primary concept under investigation. The goal of the present program is to conduct experiments that show the concept is technically feasible. The elements of the program include beam tracking, development of an efficient source, and demonstration of compact, lightweight accelerator technology.

2. Program Accomplishments and Plans: The Accelerator Test Stand was successfully demonstrated in FY 1984 with full current operation. The drift tube linear accelerator design for the ATS was completed and construction begun. An important aspect of the demonstration on the ATS is showing that the beam that exits the radio frequency quadrupole injector is properly bunched and has high transport efficiency through the drift tube linear accelerator. The required test stand was completed and will be used in the development of a continuously operating ion source.

During FY 1985, the neutral particle beam program will install drift tube linear accelerator sections on the Accelerator Test Stand and the first beam will be produced. The first major effort devoted to the design of the Accelerator Test Stand Upgrade is commencing. Work is continuing on the development of a continuous source for the required ions. Research is beginning in techniques for beam neutralization, heavy ion sources, and alternate beam bunching techniques. A rocket experiment employing a low energy accelerator is being designed. Investigation is continuing in advanced concepts (Antigone) and other advanced space particle beam concepts. Concept and Development Definition activities in FY 1985 will initiate concept definition for technology identification.

In FY 1986 demonstration of the neutral particle beam using the accelerator test stand will establish the concept. With the completion of this phase, the final design of the Accelerator Test Stand Upgrade will be

fixed. This upgrade will evolve from the Accelerator Test Stand by a series of modifications. A new ion source and accelerator cooling system will be assembled in a separate test stand to permit continuous operation. The upgrade will use a longer (in comparison to the Accelerator Test Stand) drift tube linear accelerator. The construction of the heavy ion source will be completed. The magnetic field beam expansion telescope and steering magnets for the large diameter beam expander will continue. Efforts in advanced particle beam concepts will continue with theoretical/laboratory experiments. Concept and Development Definition activities in the area of technology identification will be completed. This effort will provide concept synthesis and evaluation, performance allocation, and requirements flowdown for the space-based NPB weapons segment, supporting trade studies, and technology assessment and development planning.

In the years beyond FY 1986, neutral particle beam activities continue the development of the Accelerator Test Stand Upgrade. The upgrade will be completed and full facility operations begun. Required beam divergence will be demonstrated. The techniques demonstrated will be used to achieve the same divergence on a large diameter, high current beam. Efforts in large magnetic optics will provide a magnetic field beam expansion telescope and the development of a steering magnet for large diameter exit beam. These large magnetic optics will be integrated with the Accelerator Test Stand Upgrade and the neutralizer for an integrated ground-based neutral particle beam experiment. Key laboratory experiments related to boresighting the beam will be conducted in anticipation of the selection of a concept. Concept and Development Definition activities will conclude and be followed by a concept review.

Advanced concept investigations will establish the feasibility of the concepts of interest. Concept selection/sorting for the other advanced concepts under investigation will occur with follow-on investigations designed to establish feasibility.

D. PROJECT: 0004 - Nuclear-Driven Directed Energy Concepts

	FY 1984	FY 1985	FY 1986	FY 1987
Nuclear-Driven Systems	8.50	3.40	28.60	48.68
ATP Technology & Demonstration		2.30	19.10	22.00
Laboratory Experiments		0.20	-	23.88
Concept & Development Definition		0.50	1.00	2.80
Innovative Science and Technology		0.30	8.50	TBD
Other Technology		0.10	-	-

1. Project Description: This project supplements the DoE efforts in nuclear-driven directed energy with discrete efforts in acquisition, tracking, and pointing; concept and development definition; and innovative approaches. It contains five tasks.

The work on nuclear-driven directed energy is largely pursued by the Department of Energy and is designed to establish its technical feasibility. Equally important, the work ensures that the U.S. understands the potential impact of these emerging concepts if they were to be used against us by an adversary. It should be reiterated that emphasis in the SDI program is being given to nonnuclear weapons for defense.

SECTION IX

KINETIC ENERGY WEAPONS TECHNOLOGY (P.E. 63222C)

A. PROJECT: 0001 - Endoatmospheric Nonnuclear Kill (Endo-NNK) Technology

	FY 1984	FY 1985	FY 1986	FY 1987
Endo-NNK Technology	111.10	68.70	100.60	86.20

1. Project Description: This project is comprised of five tasks and contains research into key technologies associated with the destruction of reentry bodies within the atmosphere (endoatmospheric) with nonnuclear kill devices. The focus of this program at this time is the resolution of critical technical issues and the validation of component technologies. Upon validation of the key technologies, integration with supporting elements will subsequently lead to a complete experiment.

Endo-NNK technology development tasks in this program include:

- Seeker development
- Optical window and radome research
- Improved nonnuclear warheads
- Advanced avionics
- Propulsion systems development

2. Program Accomplishments and Plans: Specific accomplishments during FY 1984 were:

- Warhead tests against side-launched, dynamic targets
- Tests of high power conformal array antenna for a 35 gigahertz seeker
- Continued warhead database development

Planned accomplishments in 1985 include:

- Completion of initial sensor investigation
- Initiation of Phase 1 studies for alternative sensors
- Subscale and brassboard components tests

New starts are being undertaken for alternate warhead concepts. Design and fabrication of optical and millimeter wave windows, advanced guidance computers, and rapid response propulsion systems are being initiated in 1985. The critical technology components integration program plan for interceptor applications is projected to be completed in FY 1985.

B. PROJECT: 0002 - Exoat spheric Nonnuclear Kill (Exo-NNK) Technology

	FY 1984	FY 1985	FY 1986	FY 1987
Exo-NNK Technology	0.10	49.10	109.70	148.40

1. Project Description: This project includes technology development for ground-launched (missile) and space-launched (rocket and hypervelocity gun) nonnuclear kill vehicles to intercept boosters, post-boost vehicles, and reentry vehicles above the atmosphere (i.e. exoatmosphere).

There are three major separate ballistic missile defense concepts this technology program supports:

- Exoatmospheric Reentry Interceptor Experiment (ERIS)
- Space-Based Hypervelocity Gun Experiment (Sagittar Experiment)
- Space-Based Kinetic Kill Vehicle Experiment

This project includes technology development in the areas of:

- Sensors
- Fire control technology
- Propulsion
- Structures
- Guidance and control
- Guided projectiles launched by missiles or hypervelocity guns

This project also includes the development of advanced data handling capabilities required to support sensor and guidance control technologies applied to ground- and space-based missiles and hypervelocity guns.

2. Project Accomplishments and Plans: Experimental flights were successfully completed in 1984. The primary experiment, the Homing Overlay Experiment (HOE), successfully demonstrated the feasibility of nonnuclear kill of reentry vehicles. This experiment formed the basis for the ERIS demonstration program.

Initial FY 1985 activity has emphasized system concept formulation and utility analysis and Technology Requirement Definition as well as Component Tests. These support the task definition and subsequently the program planning to expand the Exo-NNK technology base. The concept formulation and utility analysis efforts will culminate in the selection of various concepts to be pursued at greater depth in later phases.

Design studies for variations of the hit-to-kill interceptor design include:

- Fire control
- Warhead design
- Structures
- Seekers/sensors
- Guidance and control
- Avionics
- Propulsion systems

The integration of these technologies into operational test projectiles and improved production technologies are also being investigated.

C. PROJECT: 0003 - Subsystem Engineering and Analysis

	FY 1984	FY 1985	FY 1986	FY 1987
Subsystem Engineering and Analysis	2.40	4.00	11.80	19.60

1. Project Description: This project is designed to establish the means and database for refinements and upgrades to multiple interceptor configurations. Technical issues will be identified, evaluated and integrated into a program to advance fundamental interceptor technology.

The technology development database will emphasize:

- Advanced propulsion
- Advanced guidance
- Advanced navigation
- Improved electronics

Performance assessments of components and subsystems will be determined through simulation, analysis and testing.

2. Program Accomplishments and Plans: Several advanced kinetic energy concepts were examined in FY 1984 and were consequently synthesized into the FY 1985 plan. These included various space-based kinetic kill vehicle concepts and the effect of increased launch velocity on the effectiveness of a hypervelocity gun defense system.

FY 1985 projected results will include significant technical accomplishments including seeker vehicle technology as well as seeker and kinetic kill vehicle experiments using advanced materials and new sensor concepts.

Detailed analyses will be performed to investigate the manner in which the various KEW elements can be integrated into an operational system architecture. These analyses will be used to identify necessary links between Surveillance, C^3, Battle Management, Space Power, and Space Logistics programs within the SDIO.

D. PROJECT: 0004 - Hypervelocity Launcher Technology

	FY 1984	FY 1985	FY 1986	FY 1987
Hypervelocity Launcher Technology	6.60	19.05	68.70	100.30

1. Project Description: This project is designed to develop, integrate, and demonstrate the pulse power and hypervelocity gun technologies required for space-based ballistic missile defense. This project researches the critical technology base for advanced hypervelocity guns capable of providing repetitive launch of guided kinetic energy kill vehicles to intercept reentry vehicles.

This project includes critical technology developments of:

- Advanced accelerator development
- Power conditioning devices
- Switching technology
- Test facilities

2. Program Accomplishments and Plans: An interim report on the analysis of space-based hypervelocity launchers was completed in FY 1984. Included in this report were the following accomplishments:

- First high velocity demonstration of distributed energy store railguns used to accelerate projectiles
- First demonstration of high mass, high energy gun
- First demonstration of rapid fire electromagnetic guns using a very high current switch
- Increase in homopolar energy density
- Increase in compulsator energy density

Support is being provided in FY 1985 for two new and three on-going efforts related to the analysis of electromagnetic gun systems. The two new starts are for technology efforts. Space launcher technology is addressed in the three continuation efforts in accelerator technology: coaxial accelerator technology, distributed energy supply railgun experimentation, and high pressure railgun accelerators.

These programs will utilize the technical direction generated by the space-based hypervelocity gun experiment program to generate the development requirements for the advanced technology programs.

E. PROJECT: 0005 - Novel Concepts

	FY 1984	FY 1985	FY 1986	FY 1987
Novel Concepts	2.30	9.00	29.50	29.50

1. Project Description: This project is designed to pursue innovative kinetic energy weapons concepts. The focus of this effort will be to synthesize the concepts, develop the critical technology, and use these technologies for major improvements.

These improvements center around the utility of ultra high velocity, lightweight guided projectiles to negate responsive missile threats. The initial technology development effort will include utilization studies of guided, agile hypervelocity projectiles. New concepts will be solicited from numerous sources such as universities, independent research laboratories, and industry to stimulate interest and nurture new concepts.

2. Program Accomplishments and Plans: FY 1984 accomplishments include initial concept and technology assessment (of utilizing specialized accelerators to launch projectiles to high velocities). A program plan including initial and critical experiments as well as modeling and analysis was prepared. Existing experimental facilities have been identified in which initial proof-of-principles experiments have been performed. In the past year, specially designed accelerators were used to accelerate massive plasmas to very high velocities.

The FY 1985 effort will assess and develop the technology needed for the proof-of-principle experiments. Initial test firings have been completed, and the test results are being analyzed. Other studies analyzing the use of high temperature plasmas for hypervelocity launchers have begun. Alternate concepts such as candidate novel kinetic energy weapons systems are also being selected for investigation.

F. PROJECT: 0006 - Endo-NNK Test Bed: High Endoatmospheric Defense Interceptor (HEDI)

	FY 1984	FY 1985	FY 1986	FY 1987
Endo-NNK Test Bed (HEDI)	36.80	27.60	101.92	255.07

1. Project Description: This project consists of a concept definition study initiated in FY 1984 and a follow-on experimental study of a nonnuclear high endoatmospheric interceptor. The first phase investigated alternative experiments and the required components for each experiment were identified. A functional demonstration will be carried out to validate and demonstrate the critical technology issues.

The critical technology development and functional demonstration will include sensors, seekers, guidance, and warheads. These technologies will be integrated and used for the demonstration of nonnuclear target

destruction. This demonstration will include an assessment of vulnerability to countermeasures and survivability in a simulated battle environment.

2. Program Accomplishments and Plans: In FY 1984 lead-time planning and analysis for the Defense-in-Depth (DID) and High Endoatmospheric Interceptor System (HEDI) concept definition were initiated. Four concept definition contracts were awarded. Component technology efforts were planned and preliminary analytical test models completed.

HEDI concept definition will continue in FY 1985. Guidance and control technology is in the preliminary stages of development. The performance threshold and quantitative goals for the functional demonstration are being studied.

FY 1986 funding will initiate contractor and subcontractor activity in both the design and component technology areas. Technology will continue to be developed at brassboard and integrated experimental levels.

G. PROJECT: 0007 - Exo-NNK Test Bed

	FY 1984	FY 1985	FY 1986	FY 1987
Exo-NNK Test Bed	24.20	12.70	120.70	185.90

1. Project Description: This project began in FY 1984 with a concept definition phase to explore alternative approaches to the design of interceptors that could accomplish nonnuclear kill of reentry vehicles in the exoatmosphere. The test assembly will be comprised of the off-the-shelf components where applicable. The second phase will be used to validate and demonstrate the solutions of critical issues associated with the preferred interceptor concepts.

Included in the technology demonstration assessment will be seeker, sensor, guidance, and warhead performance in a countermeasure environment. Successful completion of the second phase will provide the data necessary to project future system development capabilities.

2. Program Accomplishments and Plans: The FY 1984 work was pursued through parallel competitive concept definition studies to address the principal issues and feasibility of exoatmospheric nonnuclear kill of ballistic missiles. Critical component issues investigated during the concept definition phase were sensor and seekers, propulsion, guidance and control, and structures.

The major FY 1985 effort entails definition and approval of the functional technology demonstration program; competition and award of a prime contract to conduct the demonstration; and initiation of requirements assessment and design of interceptor components.

In FY 1986, work will be completed on the initial phase of subsystem requirements assessment and design. The selected prime contractor, major

subcontractors, and supporting government agency will determine the fundamental configuration of the interceptor and major components. The formal approval of this configuration will take place at the subsystem design review. The design determination process will require effort among all participants in evaluating alternative options, conducting analyses, and initiating breadboard test efforts for selected key subassemblies and their component parts.

The components of the missile and associated launch hardware and software will be progressively developed, integrated, and tested. Decision reviews throughout this period will assess progress to date and provide guidance and approval as required. This program will emphasize performance throughout the ballistic missile defense scenario. Tests will provide data which provide a baseline for future deployment decisions.

H. PROJECT: 0008 - This number is currently not in use

I. PROJECT: 0009 - Hypervelocity Launcher Development

	FY 1984	FY 1985	FY 1986	FY 1987
Hypervelocity Launcher Development	6.60	3.50	39.30	100.40

1. Project Description: This project concentrates on the development of technologies required to perform intercepts of boosters, post-boost vehicles, and RVs using space-based hypervelocity guns. This project also develops a treaty-compliant space experiment to validate concept feasibility. The task is divided into two areas: (1) a Ground-Based Hypervelocity Gun Experiment (GBHE), and (2) the Space-Based Hypervelocity Gun Experiment (Sagittar Experiment). The GBHE is a device to validate the feasibility of integrating projectiles in a hypervelocity gun. The Sagittar Experiment demonstrates the feasibility of: (1) using hypervelocity guns in space, (2) guidance and control of exoatmospheric projectiles, and (3) intercept of various space targets.

The Sagittar project is divided into six phases:

- Technical Requirements Definition
- Critical Technology Demonstration
- Breadboard Projectile, Fire Control, and Guidance System Fabrication
- Brassboard Interceptor System Demonstration
- Sagittar Ground Integration
- Space Test

The first three phases concentrate primarily on projectile, fire control, and guidance (interceptor subsystem) technology development and

validation. In addition, technology needs for other SDI PEs are also generated including launchers, power conditioning, surveillance, C^3/Battle Management, Prime Power, and Space Logistics. Phase four integrates the latest technology developments in the required areas into a space qualifiable experiment. Phase five performs the space experiment. This experiment will be conducted as permitted by the ABM Treaty. Phase six will involve data reduction and analysis.

2. Program Accomplishments and Plans: Efforts in FY 1984 concentrated on developing overall system technical requirements especially for hit-to-kill capability. Emphasis was placed on deriving mission requirements to generate critical technology needs. Critical technology roadmaps were developed for future program planning.

The FY 1985 program used the results of FY 1984 work to initiate critical technology development. Several major technical milestones have already been achieved in this program. These developments greatly enhance successful development of their concept.

J. PROJECT: 0010 - Kinetic Kill Vehicle (KKV)

	FY 1984	FY 1985	FY 1986	FY 1987
Kinetic Kill Vehicle	5.50	30.00	147.40	221.40

1. Project Description: This project provides for concept design, technology development, test and evaluation for a space-based, rocket powered kinetic energy experiment. This project is conducted in two parts; technology verification and concept definition.

The technology verification effort will perform critical technology demonstrations which reflect the capabilities needed by the various subsystems. Included in these demonstrations will be:

- Off-the-shelf rocket booster technology
- Divert rocket motor technology
- High performance kill vehicle
- Fire control/guidance

After technology verification, these technologies will then be integrated and subsequently flight testing of the experiment will begin.

2. Program Accomplishments and Plans: Concept formulation studies of FY 1984 on existing contracts were extended to include technical requirement definitions. Technology verification efforts were initiated in FY 1985. These efforts are investigating high performance kill vehicle design as well as booster and divert (maneuver) propulsion technology with recently awarded contracts. The Phase 1 concept definition request for proposal was released.

The KKV experiment program will be initiated in FY 1986. The results from the technology verification will enable completion of the KKV experimental design. The KKV experiment will then reach the critical design review phase.

K. PROJECT: 0011 - Terminal Technologies Integration

	FY 1984	FY 1985	FY 1986	FY 1987
Terminal Technologies Integration	0.10	32.30	130.10	91.80

1. Project Description: This program consists of the systems engineering, systems analysis, and system integration to support test activities for evaluation of technologies associated with integration of the elements of complete kinetic energy weapons system. Support activities will include experimental diagnostics and resources for assembly of experimental elements at the test site.

2. Project Accomplishments and Plans: Based on initiation of component technology efforts in FY 1984, program planning began for conducting an integrated technology demonstration. Definition of requirements for an integrated technology also began.

Award selection is being made to conduct analyses and establish goals for technology elements. Interfaces between system elements are being identified and defined. Test requirements and hardware capabilities are being developed.

Computer capability will be established for experimental trade-off analyses. Interface compatibility among experimental elements will be maintained, and instrumentation/facility requirements for testing will be developed.

This effort results in a complete simulation of the operations of and the interactions among experimental elements. It will be validated against the capabilities of the near-term feasibility demonstration subsystems and will have the capability to incorporate actual elements of the program. The culmination of this activity is an experimental validation of the feasibility of the integrated technologies.

SECTION X

SYSTEMS CONCEPTS/BATTLE MANAGEMENT (P.E. 63223C)

This program researches technologies to implement command and control systems for defense against ballistic missiles. It includes 2 projects and 10 tasks.

A. PROJECT: 3001 - Battle Management/Command, Control and Communications (BM/C^3)

	FY 1984	FY 1985	FY 1986	FY 1987
Battle Management/C^3		46.00	145.06	164.85
BM/C^3 Architecture		9.00	38.00	43.45
Processor Technology		14.50	42.80	48.60
Software Technology		13.70	44.86	50.90
Communication Technology		8.80	19.40	21.90

1. Project Description: This project has four tasks. It is designed to research technologies required to support responsive, reliable, survivable BM/C^3 for ballistic missile defense.

The purpose of the Architecture Concepts task is to define state-of-the-art BM/C^3 architectures. Studies and analyses will establish quantitative subsystem functional and technical requirements for processing, software and communications. Integrated and non-integrated systems architectures and at least two-to-four alternative architectures for the BM/C^3 system shall be developed. Battle management systems and strategies will be evaluated. The studies will include consideration of status monitoring, weapon alert, information management, attack characterization, weapon activation, weapon release, target prioritization, target assignment, self-defense coordination and countermeasure management. Emphasis will be placed on overall resource allocation and techniques for optimal allocation. An appropriate level of human interaction will be determined. In order to make choices among different architectures and to test adequately these architectures, realistic simulations that accurately model the stressed environment are needed. The requirements for these simulations and supporting facilities will be developed and initial models put into place.

The Processing Technology task is concerned with developing high performance fault-tolerant computing hardware and supporting operating systems. This effort will lead to specification of computer architectures with the requisite performance characteristics designed to operate in a hostile environment. The first step is to develop fault-tolerant strategies to meet the requirements. Alternative concepts will be based on a hierarchy of fault-tolerant detection, recovery, and error checking. Alternative fault tolerant techniques such as redundant networking, built-in-intelligence, selective component redundancy, and redundant self test and repair techniques will be researched. Detailed processor designs that are real-time, high performance, and fault-tolerant will be produced, and development plans will be written. Utilizing real-time distributed computing systems, this task

will evaluate innovative fault-tolerant techniques relative to complex distributed computing systems. Such techniques as embedded positioning, recovery algorithms, backup sparing, dynamic reassignment, and alternative voting will be evaluated.

The Software Technology task is concerned with achieving the ability to develop large, complex software systems to carry out battle management mission requirements. This effort will provide the means for developing trusted software that can be reliably modified and adapted, and algorithms and management concepts for such functions as network management, situation assessment, and weapon release in an uncertain, rapidly changing environment. The highest priority is to establish a set of software development concepts and techniques. Advanced development methodologies such as rapid prototyping expert systems, concurrency detection and exploration, and reusable software and designs will be analyzed for their applicability to support the creative software development process. Improved techniques such as program and design slicing, attribute generation analysis, symbolic execution, and forward effect tracing and analysis will be developed to assess software quality at all stages of development and preclude certain classes of errors from existing. Techniques will be developed to permit software validation testing during the development cycle. Extensive experimentation and evaluation of software development concepts will be performed to evaluate their capabilities and identify potential areas for significant improvement. A series of BM/C^3 experiments will be conducted to quantify algorithm and hardware requirements, and communication rates, for a BM/C^3 system. In conjunction with system definition efforts, a set of BM/C^3 computing requirements will be generated. Techniques to allow implementation of algorithms in a geographically distributed network will be developed. The issues of data management, fault-tolerance, data communication, and control will be investigated in developing a system-level specification for a large-scale systems network controller. Development of algorithms for situation assessment, kill assessment, damage assessment, defensive firing strategies, and network management will also be initiated.

The Battle Management Communications technology task includes the analysis of communication network requirements, definitions of network architecture, identification and development of technology requirements, development of a candidate system test bed, and evaluation through simulation of the communications systems. Network architectures based on results of the analyses conducted in the Systems Architecture project will be prepared and investigated with respect to system switching and netting, link description, and aspects of vulnerability and survivability. Initial technology investigations will concentrate on state-of-the-art technologies that have application to SDI battle management communications. In addition, technology development programs to satisfy battle management communications network requirements will include radio frequency (RF) subsystems, antennas, networks and switching, signal processors, and laser communications. Based on these efforts, a candidate communication network will be designed, developed, and evaluated using software and hardware simulation.

2. Program Accomplishments and Plans: Since BM/C^3 technology required to support the President's SDI is significantly more complex than that being pursued in previous Army and Air Force programs in this area, early emphasis was on assessing approaches and defining research and advanced technology

programs for each of the tasks. Critical technologies to be pursued and data needed to define requirements were identified in FY 1984 for each area, and program plans were defined.

A baseline set of system requirements in the Architecture Concepts task are being defined to drive the development of fault-tolerant concepts, technologies and design. Based on these requirements, critical circuit technology developments are being initiated that can withstand both high radiation dose rates and single event upsets. Combined hardware and software techniques are being developed to make the resulting system resilient to temporary faults as well as catastrophic failures in major subsystems. The goal is to develop a system that can operate in space for ten years without maintenance.

An initial set of requirements for software development technologies in the Processing Technology task is being defined based on analyses of the BM/C^3 functions needed. These requirements are being matched against existing software development structures, and a set of technology enhancements will be defined. Alternative software development approaches are being selected for further development. The selected approaches must offer the potential for efficient generation of software that can be formally specified and verified. Automated tools needed to assist in the software development process are being defined.

Beginning in FY 1985, and continuing through FY 1989, studies in the Software Technology task are being made on the speed and accuracy with which human test subjects can assess situations and make decisions. Performance is being compared as a function of the format and content of the data displayed, in situations that realistically represent possible battle scenarios. Data is being developed for evaluating the feasibility of various command doctrines and the usefulness of automated aids under stress.

For the Battle Management Communications task, beginning in FY 1985 and progressing through FY 1987, protocols are being developed for an internetted communications system to support multi-tier defenses. This network is to be self-managing and capable of providing arbitrary connectivity between any pair of points. Protocol development must support real-time communications with low delay, priority messages, self-diagnosing and self-healing capabilities, and dynamic load balancing. Alternative candidate network configurations are also being analyzed to assess their ability to satisfy the requirements defined in FY 1984. Among these candidates will be DARPA's Airborne Packet Network. Also, under this task, 60 gigahertz microwave and laser carrier links needed to support the internetted communications system are being defined.

Candidate algorithms for key battle management applications are being developed for evaluation. These algorithms must be suitable for use in a widely dispersed, loosely coupled, real-time distributed computing system. Low delay, minimum overhead and fault-tolerance are required to maintain a high level of object correlation and data base consistency and to provide robustness in the presence of network or component failures. The role of knowledge-based systems and artificial intelligence in BM/C^3 functions are also being evaluated.

Based on efforts undertaken in FY 1985, work will continue on the development of fault-tolerant information processing concepts, technology and design; software development techniques which lead to high-confidence, error-free software systems; battle management algorithms; and communications network technology, concepts and protocols.

Critical circuit technology development will continue. Results from the efforts in hardened microelectronics and fault-tolerant computing will be combined with research on high performance architectures to build machines with the performance and reliability to support battle management. A fault-tolerant architecture will be defined. Space-qualified hardware will be fabricated and tested.

Development of methodologies and tools needed to support the entire software life cycle will continue. All of the work will be closely keyed to the actual BM/C^3 system needs. Whenever possible the methods and tools developed will be applied to intermediate SDI system demonstration. Facilities designed for critical test of the software generation processes will be available. Detailed methods of generating verifiable software and automated tools to permit efficient software generation will be available.

A goal of this project is to have an adequate basis for defense activation doctrine and for design of command interfaces in a ballistic missile defense system. A simulator or simulators that would be used for testing and refining interface designs, and for training and demonstration purposes will be implemented.

Beginning in FY 1986, two candidate network approaches will be developed and experimentally verified, using the defined network protocols. A program will be initiated to breadboard and test in the field a ground-air-space internetted system. This long-term project will serve as a test bed to refine and make operational the concepts for network communications defined earlier in the programs.

Development of algorithms for the BM/C^3 functions will continue. Artificial intelligence concepts will be incorporated into the algorithms wherever potential payoffs exist. As sensor and weapon technologies become better defined, the early algorithms based on initial assumptions will have to be refined. Test facilities will be developed to aid in evaluating these algorithms for completeness and computing requirements and for testing them in simulated environments.

B. PROJECT: 3002 - SDI Systems Architectures

	FY 1984	FY 1985	FY 1986	FY 1987
SDI Systems Architectures		53.00	98.24	107.68
Threat Analysis		5.80	10.68	11.69
Systems Architecture Studies		20.00	35.20	24.29
Pilot Architecture Study		3.10	2.00	2.00
Program Integration		2.50	5.00	5.00
Functional Analyses & Modeling		6.00	16.10	24.80
Systems Concepts & Simulation		15.60	29.26	39.90

1. Project Description: This project is comprised of six tasks. It will establish system architectural alternatives based on defense missions and objectives, threat assessments, and weapon/sensor technology assessments. From these candidate architectures, system component performance requirements will be derived.

The Threat task will provide projections of possible ballistic missile threat force structures usable against the U.S. and its Allies. Analyses will be conducted to define responses which might be invoked to counter defense concepts. All information will be maintained in a centralized data base.

The Systems Architecture task is structured to define and evaluate candidate system architectures, system concepts, and parametric tradeoffs leading to the evaluation of preferred architectures. This will allow assessment of key technologies and system functions. The pilot architecture being developed by a team from Federal Contract Research Centers (FCRCs) and National Laboratories will provide an early formulation of these system architectures and tradeoffs and an initial reference to SDIO for evaluation and comparison of alternative architectures that are developed by industry contractors as part of the SDI System Architecture and Key Tradeoff Study.

The Program Integration task is designed to synthesize and integrate the data generated by the systems architectures and coordinate the technical inputs at the systems level with the technology programs in other SDI program elements. Additionally, the adequacy of the industrial base necessary to support the SDIO plan and perform studies and analyses that permit the implementation of cost saving measures will be evaluated.

The Functional Analyses and Modeling task will analyze cross-cutting system functions such as discrimination, track data base and handoff, and kill assessment. These functions are pervasive throughout a multi-tiered defensive concept and must be planned for in an integrated manner. The requirements of these functions will undoubtedly drive the data processing requirements for which the battle management technology effort must provide the necessary research.

The Systems Concepts task is structured to define boost, post-boost, midcourse, and terminal system performance requirements. Detailed trade studies will support cost-effective concept decisions and analyze key issues concerning functional requirements for system components. Advanced technologies will be evaluated in a systems context to ensure that risk is properly assessed. A detailed multi-tier computer simulation will integrate models of interceptors, sensors, and BM/C^3 in order to do component tradeoff studies and derive effectiveness estimates of each tier.

2. Program Accomplishments and Plans: Emphasis in FY 1984 was on defining the baseline threat and generation of baseline SDI system requirements.

In coordination with the intelligence community, a time-phased expected strategic threat and attack scenario was defined. Strategy and policy issues, and constraints are regarded as inputs and outputs. Architecture methodology and selection criteria are under development. Analyses and evaluation of boost, post-boost, midcourse, and terminal phase SDI concepts

initiated in previous years were continued. Strawman system conceptual designs and iterated allocation of resources and constraints among defense phases in sufficient detail to document initially perceived SDI system requirements were developed. Architectural systems and cost models with interactive application and refinement to the architectures were chosen on a more generic level. Examination of the impact of future technologies and national resources on strategic defenses, strategy and policy is beginning.

To supplement the initial analytical approaches, the FY 1985 effort is concentrating on developing modeling capability and simulation facilities (hardware and software) that provide the flexibility to analyze and evaluate evolving technologies and system designs as well as responsive enemy threats. Emphasis is on developing system-wide compatible simulations.

An initial baseline threat document is being published. Threats and scenarios are being continually reexamined and reanalyzed as new data is collected. Flexible threat drivers are being developed to input system simulations.

Analyses and evaluations of all phases of a multi-tier defense system are continuing, but emphasis is on modeling the various subsystems such as sensor-weapon platforms, and battle environments such as sensor noise backgrounds. In addition, component and subsystem cost models are being developed as technology evolves. Simulations that allow realistic measurements of system performance are being constructed, to the degree possible, for an evolving system design. These simulations should provide the major tools for (1) evaluating parametric trade-offs of alternate technologies/concepts; (2) accurately determining weapon leakage and defense system survivability; (3) estimating defense system degradation under various attack scenarios; and, (4) conducting cost-effectiveness comparisons of alternate technologies/approaches.

Detailed analyses are being made of multi-tier BM/C^3 issues, and development of a BM/C^3 national ground test facility and development evaluation facilities are being initiated. System engagement simulation models that incorporate realistic BM/C^3, Soviet threat and environment models are being defined and developed to assist mission evaluation and performance requirements generation. Preliminary concepts of operation are being determined and pacing technologies identified.

Projections and impact studies of potential future technologies and national resource requirements are continuing in an effort to identify likely drivers in weapons, sensors, support, operations and maintenance for a projected multi-tiered ballistic missile defense.

The evaluation and analysis of evolving SDI technologies and designs with emphasis on the internal system interfaces are continuing. The analysis of potential responsive threats with which the system will have to cope and the development of appropriate scenarios for use in system simulations and evaluations is being pursued. The detailed analysis of multi-tiered battle management/C^3 issues and architectures is also continuing. The concept definition of a development evaluation facility is expected to be completed.

SECTION XI

SURVIVABILITY, LETHALITY AND KEY TECHNOLOGIES (P.E. 63224C)

This program includes technology for enhancing survivability, reducing uncertainties regarding kill mechanisms and vulnerabilities, evaluation of countermeasures, investigating the needs of logistics, and improvement of space power. It includes 4 projects and 16 tasks.

A. PROJECT: 0010 - System Survivability

	FY 1984	FY 1985	FY 1986	FY 1987
System Survivability	9.20	36.20	72.15	88.70
Survivability Assessment		1.50	3.45	4.90
Survivability Analysis		3.60	5.00	6.00
Threat Refinement		3.00	3.25	5.10
Countermeasures Development		28.10	60.45	72.70

1. Project Description: The SDIO is charged with the responsibility of conducting research on promising technologies and evaluating concepts for defense-in-depth systems. Such concepts must be affordable and possess two major attributes - effective kill capability and enduring survivability.

The Survivability Project is a balanced set of four tasks that will concentrate on efforts to: (1) describe more fully a threat, (2) assist in the development of a system architecture with adequate survivability, (3) develop hardening techniques, and (4) develop active and passive countermeasures. The project is structured to satisfy the needs of the systems analysts, systems designers, and technologists in their efforts by: (1) identifying promising survivability concepts, techniques, and tactics, (2) ensuring such concepts and tactics are evaluated in the context of performance of and penalty to SDI candidate systems, (3) developing the generic technology base for systems designers to apply the effective survivability measures to designs of candidate systems, and (4) defining a threat to support survivability evaluation and countermeasures development.

A more detailed description of a threat will be developed to investigate survivability needs and develop a broad data base for selecting survivability technology and techniques. An analysis and evaluation capability is being further developed and refined to: (1) survey, document, and periodically update the status of survivability activities, (2) assist the Systems Architect in survivability matters for development of the architecture and making engineering decisions, and (3) develop a set of recommended systems requirements for a survivability data base. Based on the threat and systems needs, a technology data base will be developed for use by systems designers. In the countermeasures area, a major effort will be undertaken to investigate promising technologies.

2. Program Accomplishments and Plans: A number of Service and Agency programs have examined the problem of space system survivability and funded

the development of the requisite technologies. Portions of these on-going programs were moved into the SDI survivability program in FY 1985 and beyond. In FY 1984, efforts were focused on SDI issues to ensure that the Services and Agencies responsible for executing SDI would be in a position to use effectively funding appropriated in successive years. Experimental data and analytical results pertaining to the response of spacecraft components was compiled.

Activities in FY 1985 have continued the basic technology program. Survivability/endurability requirements and goals for system elements are being defined. The performance capabilities of candidate technologies are being defined. Testing of selected materials and concepts will be conducted, and nuclear-hardened detector development has been started. Promising materials and configurations are being explored. In the countermeasures area, a multiyear development and test program is planned to support system concept definition efforts. In FY 1985, requirements and concept studies initiated in FY 1984 are being completed, and the design/development is continuing. Competitive contracts have been initiated.

Activities and efforts begun or transferred into SDI in FY 1984 and 1985 will continue in FY 1986. A major change is being made to bring focus on these activities into synchronism with the plans of SDIO, so that informed decisions may be made in the early 1990s. Survivability experts working within this project are participating with the groups involved in SDI. They are also reviewing and will continue to review contractor activities concerning investigations relative to survivability. Most of these experts are also participating in activities that bring a significant cross-fertilization of concepts and development to relevant activities. This consultation and cross-fertilization will make a major contribution to SDI efforts in FY 1986 and for the following several years.

There is an urgency for prerequisite information on policy and strategy for a strategic defense. Some preliminary suppositions regarding a threat have been generated. Part of the FY 1985 activities has been to make intelligent assumptions on strategy against a postulated threat. In FY 1986, analysts and technology investigators will proceed with the four major tasks, using the results available from the pilot architecture and the initial Phase I System Architecture Studies.

Specifically, several independent top-level assessments and analyses will be initiated by SDIO to provide hard, discrete information on a number of issues concerning the overall survivability policy and strategy associated with SDI. Several contracts will be undertaken to stimulate innovative thinking and evolve bright ideas for enhancing survivability. The analyses task in FY 1986 will continue including construction and refinement of the set of options for negating or mitigating a threat. It will include a preliminary analysis of tactics and techniques, and an evaluation of the status of survivability activities in relevant systems projects. In addition, this task is expected to generate a set of recommendations for improving survivability in systems concepts where required. The task on active and passive countermeasures is expected to require the largest increase in funding for the survivability project in FY 1986. The increase will be incurred as a result of the need for substantial investments in a number of investigations.

There will also be some laboratory testing and simulation performed for some of the more advanced and less complex techniques. Initial guidelines for hardening will be developed. Engineering compatibility analyses will be performed. A design handbook will be generated for use in designing protection of space assets. It is anticipated that significant progress in active countermeasures will be made in defining the requirements. Overall countermeasure design projects should produce some significant concepts.

It is evident that there are commonalities and some mistakenly perceived duplications between survivability and lethality projects. There are instances when common projects can yield information for both fields. In fact, there are far more voids of information in both areas than there are potentially duplicative activities. There will be substantial coordination in FY 1986 to ensure the most efficient use by technologists in both areas and to design projects that meet common needs.

Survivability is not an end item of itself but a vital attribute to the design of a strategic defense. As such the whole program is designed to determine what is occurring in survivability; to assist others in making best use of technology and techniques; to assist in the development of evaluation techniques and engineering solutions; and to develop a wide-use survivability technology base for designers. To these ends, this program is designed to have an expert grasp of technology and information adequate to support decisions regarding strategic defense survivability in the early 1990s.

As a system architecture matures, there will be an evident need to increase specific and discrete support for evaluations of systems concepts. As systems concepts are described more adequately, there will be a continuing vigorous program which both anticipates systems designers and evaluators. At the same time, there will be continuing efforts to extend the knowledge concerning technology and ideas that show promise in enhancing survivability.

Projects involving both active and passive countermeasures may require some flight and space experiments, or other extensive laboratory and assurance testing.

B. PROJECT: 0011 - Lethality and Target Hardening

	FY 1984	FY 1985	FY 1986	FY 1987
Lethality and Target Hardening	11.30	63.30	103.50	121.60
Thermal Lasers		23.70	22.25	24.50
Impulse Lasers		8.10	14.95	12.30
X-Ray Lasers		8.20	20.35	28.50
Particle Beams		7.00	8.25	9.90
Kinetic Energy		10.00	23.55	26.50
High Power Microwaves		6.30	14.15	19.90

1. Project Description: The report of the Defensive Technology Study Team cited the importance of lethality and target hardness efforts by noting that accurate knowledge will be needed of the effects that various weapon

concepts have on targets. This project has six tasks. Its purpose is to determine the comprehensive effects on damage to and vulnerability of a variety of targets. Test data will be used to validate theoretical models of the response of electronic subsystems and will determine the induced structural response and failure modes. In addition, the data base developed will be provided to the Systems Survivability project and will be used as the initial basis for estimating the vulnerability of potential U.S. defensive systems to foreign threats. This information will allow technical trade off evaluations to be made and will support decisions on which specific ballistic missile defense system concepts might be selected for further development. Testing on realistic systems and mock-ups will allow determination of weapon lethalities before large investments are made. Hardening techniques will be developed, incorporated into system testing, and evaluated with respect to performance, mission impact, cost, maintainability, and survivability to collateral effects. All SDI Lethality and Target Hardening efforts will be closely coordinated with complementary weapon research efforts in the Department of Energy.

2. Program Accomplishments and Plans: For a number of years, various Service and Agency programs have funded limited examinations of lethality and target hardness issues for particular applications. Portions of these programs were integrated into the SDI lethality program in FY 1985 and beyond. The funding reflected in FY 1984 in SDI was used to focus these on-going efforts on SDI issues to ensure that the Service and Agencies responsible for executing SDI were in a position to effectively use funding appropriated in FY 1985.

A number of subscale experiments were conducted in certain facilities (Laser Test Range, the Sandia Optical Range, the Air Force Weapons Laboratory, the Department of Energy Laboratories, numerous universities, and other laboratory laser facilities) to provide a detailed understanding of material and structural response. Validation experiments were conducted and assessments were performed using existing data. Design of initial test samples and test hardware is being completed during FY 1985, and material hardening evaluated based on preliminary test data. Test methodologies will be constructed and applied to component, subsystem, and system testing. Analytical and computational tools are being developed to determine technical feasibility and cost impacts.

Lethality and Target Hardening efforts initiated in FY 1984-1985 will continue in FY 1986 with emphasis on testing at the dedicated test facilities.

C. PROJECT: 0012 - Space Power and Power Conversion

	FY 1984	FY 1985	FY 1986	FY 1987
Space Power and Power Conversion	2.00	11.00	63.80	76.80
Multimegawatt Management		1.00	3.20	3.90
Multimegawatt Industry Concept		1.00	3.20	3.90
Multimegawatt Lab Concept		1.00	3.20	3.90
Multimegawatt Technology			38.20	45.40
SP-100 (100 kWe Class)		8.00	16.00	19.70

1. Project Description: The vast majority of electrical power used on current spacecraft is generated using solar arrays. Other techniques need to be investigated to satisfy the needs of the various elements of any deployed, multi-tiered defense system. This project has been established to develop power generation and conversion technologies capable of providing large quantities of specially conditioned electrical power for SDI needs. This project consists of two primary tasks: the joint SDI/DOE Multimegawatt (MMW) task and the joint SDI/NASA/DOE SP-100 task. (A third possible task, generic power conditioning, is under consideration but is not included in the current budget figures.)

SP-100 is a 100-kWe-class nuclear power subsystem which can be expanded to power levels of 1 or 2 megawatts. This technology is needed to provide not only moderate continuous power levels for various SDI missions, but also as an enabling technology for several NASA and non-SDI military missions planned for the 1990s. DOD representation in the tri-agency SP-100 project was transferred from DARPA to SDIO in October, 1984. In FY 1985, the SP-100 project is completing the system definition and concept selection phase, and is proceeding into engineering tests of critical components in FY 1986. The major elements of the current phase are safety, mission analysis and requirements, system definition, and supporting technology development.

The MMW project is being initiated in FY 1985 to address the SDI requirements for both high-level continuous power and burst-mode power. The objective of the MMW project is to advance the technology sufficiently by 1991 so that ground engineering subsystem development can be initiated on one or two concepts that have the potential for satisfying mission requirements within acceptable cost and mass constraints. The strategy is to: (1) solicit and evaluate a broad spectrum of potential concepts from industry and laboratories, (2) narrow the number of potential concepts to 5 or 6 by early FY 1986 and embark on both generic and concept-specific technology development, (3) further narrow the number of concepts to 2 or 3 by FY 1988 and focus the primary technology efforts in support of these concepts, and (4) continue to develop the data base for these concepts to enable selection of the design(s) for ground engineering test. Both nuclear and nonnuclear power sources will be evaluated. Examples of power conversion options include open and closed Brayton cycles, Rankine cycles, magnetohydrodynamics, and thermionics. To support the SDI power subsystem development activities, an independent evaluation group (IEG) is being formed in FY 1985. The functions of the IEG are to: (1) advise the SDI Space Power Project Office on the technical merits, trades, and technology needs of proposed concepts, (2) to identify and track the evolving SDI power subsystem requirements and interfaces through coordination with other SDI program elements, and (3) to provide power subsystem analysis and models to support SDI Systems Analysis (P.E. 62223C).

2. Program Accomplishments and Plans: The SP-100 project proceeded on-schedule and within cost in FY 1984. The primary areas of study were system definition, technology development, safety, and mission analysis and requirements. Three systems contractors were selected to continue preliminary design and analysis of baseline, backup, and growth configurations. The project focused on identifying and resolving the technical feasibility issues associated with three candidate systems: (1) a fast liquid-lithium

cooled reactor coupled with an advanced thermoelectric converter, (2) an in-core thermionic system with a pumped sodium-potassium coolant, and (3) a relatively low-temperature fast reactor coupled with a free-piston Stirling engine system. Safety issues have been identified for all three systems, and independent criticality analyses are being performed for both normal operation and accident modes. Within the technology development activity: (1) a high-efficiency, lanthanum sulfide, n-type thermoelectric material has been tested successfully on a laboratory scale, (2) candidate insulator materials for long-life thermionic cells are identified, (3) and a contract was awarded to build a 25kWe free piston Stirling engine to verify scale-up capability and operation at low temperature ratios. Mission studies have identified an abundance of military, NASA, and commercial payloads which are enabled by or could benefit from the SP-100 power system technology. As an extension of the SP-100 project, several preliminary configurations for providing continuous and burst-mode multi-megawatt power levels were generated to aid in the planning of the MMW project.

The SP-100 continues to focus on the system analysis and supporting technology development necessary to allow a single baseline configuration to be selected in July 1985 for subsystem and component engineering tests. These development tests are necessary to enable a flight prototype system to be available in time to support "near-term" military missions in the mid 1990s, should such a decision be made. Technology development activities to support the July 1985 decision include in-pile testing of candidate full-clad combinations, irradiation tests of thermionic cell insulators, continued work on a high-efficiency, p-type thermoelectric material, and initiation of tests on the Stirling engine. Safety evaluations of the three configurations is continuing. Guidance is being issued on reentry design options. Mission analysis is being expanded to include payloads requiring moderate levels of continuous power. In the area of management, a new Memorandum of Agreement among the participating agencies is being prepared for Phase 2.

FY 1985 is primarily a planning year for the MMW project. The FY 1985 budget allows for only top-level configuration studies and screening of these concepts. The key activities in FY 1985 are: (1) establishment of the MMW SDI/DOE management structure including a supplemental Memorandum of Agreement, (2) formation of the IEG, (3) solicitation and assessment of advanced concepts for MMW subsystems and components, (4) screening of concepts for further development in FY 1986, and (5) revision of the technology development plan to reflect the generic and concept-specific technology needs of the MMW power subsystems.

Having selected the SP-100 configuration for a ground engineering system in FY 1985, the main programmatic milestone in FY 1986 is selection of and awarding of the contract to a systems contractor to do the detailed design and development of the test articles. The major test item is the reactor which will be the first space reactor built in the United States in over a decade. An appropriate DOE site will be selected for the reactor test. The other engineering tests to be performed include the power conversion, heat transport, and heat rejection subsystems. The technology data base developed under the SP-100 project can be applied directly to the MMW project.

For the MMW project, FY 1986 marks the beginning of the technology development effort needed to support the selection to the final feasibility decision on the ground engineering configuration(s) and contract awarding of the follow-on studies. Program risk is highly dependent on the number of concepts which can be studied in FY 1986 and FY 1987 since SDI power requirements are evolving during this time period, and many technical feasibility issues associated with the power subsystems need to be identified and addressed. The focus of the effort is on identifying power subsystems which are reliable, survivable, and affordable within the context of the SDI architecture, and resolving the related feasibility issues. Large reductions in power subsystem mass are necessary before deployment will be practical. Design analysis and configuration optimization studies on approximately six concepts will be initiated and continue through FY 1986. Both the generic and concept-specific technology development activities will be initiated at the beginning of the fiscal year. Both nuclear and nonnuclear concepts and technologies will be pursued. The generic technology areas include nuclear fuels, surety, power conversion, materials, thermal management, energy storage, and controls and instrumentation. Power subsystem modeling and analysis tasks will continue through FY 1986 to support both the IEG and SDI Systems Analysis (P.E. 62223C).

Ground engineering tests of the major SP-100 subsystems will be completed in FY 1990 at which time technical feasibility will have been established. This schedule is based, of course, on total anticipated funding levels from the three participating agencies. It is expected that the timeframe of the initial mission for the SP-100 technology will have been established firmly by the end of Phase 2 and that the project will be restructured at that time. For the MMW project, selection of candidate concepts will continue through FY 1990 followed by a decision on which design or designs will proceed into ground engineering tests.

D. PROJECT: 0013 - Space Logistics

	FY 1984	FY 1985	FY 1986	FY 1987
Space Logistics	1.00	1.50	18.70	29.60

1. Project Description: The Defense Technologies Study and on-going analyses have indicated that the economic feasibility of multi-layered ballistic missile defense systems against a fully responsive threat may well depend on our ability to reduce significantly the cost of logistically supporting such systems. This project funds the definition of various space logistic architectures, and the identification and development of the needed technologies. Areas to be investigated include, but are not limited to, heavy lift launch orbit-to-orbit assembly/servicing, robotics, reusable systems, and advanced cyrogenic engine systems. Because both NASA and the Air Force have interest in future space logistics infrastructures, joint studies are envisioned. In addition, it is not clear that there is adequate knowledge of a logistics infrastructure to support a complex space force of the magnitude and complexity envisioned. This project is established to: (1) pursue research in these areas, (2) bring a logical focus to work on

potential relevant technologies, and (3) construct a body of knowledge which would contribute to making an informed decision regarding systems development.

2. Program Accomplishments and Plans: The Air Force and NASA were advised of the recommendations and conclusions of the DTS in the space logistics area and a small supplemental funding of less than $1 million was directed in FY 1984 to focus on-going efforts on SDI issues.

The primary objectives in FY 1985 are to structure a management organization and to complete planning for outyear investments. A joint SDIO/Air Force/NASA Space Logistics Study is being initiated to examine the total infrastructure and capabilities need to satisfy emerging SDI requirements. Critical trade-offs between competing approaches to more cost-effective space transport are being conducted including the key trade-off between assembly on orbit and launch of integrated payloads. The principal output from this study will be: (1) a detailed investment strategy for technology funding in FY 1986 and the outyears, and (2) support to system architects and system designers in the area of space logistics. Technologies that are candidates for funding include improved cryogenic engines, reusability of lift and transfer capabilities, and zero-gravity transfer of propellants; the infrastructure of an entire logistical support network; and a refined investment strategy to provide the expert body of knowledge to make informed decisions.

Efforts should be completed on the initial study to describe both the immediate and longer term goals for research, the more promising technology pursuits, and a reasonable investment strategy. This study will be continued and expanded to examine more thoroughly the underlying foundation and framework of the logistics network to determine its extent and role in any defense force. It will be integrated with the overall SDI architecture to assist in establishing the needs of the major systems, criteria for evaluating logistical support in the system, and in offering engineering solutions. Parametric studies will be performed to measure pay-offs for promising technologies. Research programs will be initiated notably in cryogenic engine technology. Other initiations will depend on the results of the initial study. Continued studies will be funded at approximately $4-5 million. Various technology research efforts will be funded using the balance of available funding. There will be a high degree of cooperation between the Air Force and NASA on this project.

Goals are being established so that enhancements for the next decade can be envisioned adequately by 1990 with improved capabilities for a more ambitious force after the turn of the century. This task could be pacing for the decision whether or not to develop a system and might be a major cost driver in the overall architecture. It is clearly recognized as a program that must be time-phased with the overall objectives of the SDI.

SECTION XII

GENERAL MANAGEMENT SUPPORT (P.E. 65898C)

This program includes the support for management resources to the Director and staff of the Strategic Defense Initiative Organization. The support includes civilian pay, travel expenses, transportation, rents, contractural services, supplies, and equipment. The sole project is identical with the program.

A. PROJECT: 0001 - Program Management

	FY 1984	FY 1985	FY 1986	FY 1987
Program Management		8.00	9.22	10.00

1. Project Description: This project provides the management support resources for the SDIO Director and staff. Specifically, the Director and staff: plan and manage the resources in the five SDIO technical program elements and this management support program element; act as the primary agent for technical advocacy of the SDIO programs; support in-house efforts to conduct research in selected scientific areas related to SDIO needs; monitor and survey research into technologies of interest to the SDIO; provide liaison with the scientific community in areas of interest to SDIO; stimulate creative and innovative research that has the potential for advancing technology for the strategic defense mission; work closely with other government agencies on SDI activities; and support the Secretary of Defense in SDI matters.

The resources for this project are less than 1% of the overall SDIO budget.

2. Program Accomplishments and Plans: The SDIO was established as an Agency of the Department of Defense in FY 1984. When the SDIO subsumed the activities considered to be a part of the SDI, the Organization began to provide its own general management support.

There has been a continuing growth of the SDIO and its activities. Modest program increases in this element provide for funding to increase civilian manning to authorized levels and general management support of the Strategic Defense Initiative Organization.

SECTION XIII

RESOURCE REQUIREMENTS

The ongoing activities and resources that the Strategic Defense Initiative received at its inception consisted of many Service and Agency programs, plus resources for investing in new starts and for tailoring the existing programs to SDI needs. One such ongoing effort was the Army Ballistic Missile Defense program. A second example was the effort involved in improving missile launch detection programs for warning of nuclear attack. The majority of the resources previously planned for this first group of programs were, in fact, applied by the SDIO to that group. Intensive planning and evaluation activities over an 18-month period from March 1983 by independent study groups and the SDIO staff, supported by DoD Services and Agencies, NASA, and DoE, resulted in plans to invest additional resources to refocus and enhance these existing programs and begin needed new ones. Such planning activities will continue for at least the remainder of FY 1985.

Estimates are that the SDI will cost about $26 billion between fiscal years 1985 and 1989. This amount represents less than 2% of the defense budget, and less than 15% of the defense research budget for this period. The Department of Defense and Department of Energy had planned to request between $15 - 18 billion during this period for related research activities, even without a new focus on ballistic missile defense. Indeed, many of the new technologies, such as sensors, were already recognized to have great potential for a wide range of defense missions.

In the SDIO proposed budget, the largest single item is the Surveillance, Acquisition, Tracking and Kill Assessment (SATKA) program, which represents almost 40% of the total program. Work in weapons-related areas is about evenly divided between directed energy and kinetic energy technology. It is particularly important to note that about 5% of the SDIO budget has been reserved for innovative science and technology programs.

SDIO BUDGET SUMMARY ($ in Millions)

	FY 1985 Appropriation	FY 1986 Request	FY 1987 Estimate*
Surveillance, Acquisition, Tracking and Kill Assessment	$ 546	$1386	$1875
Directed Energy Weapons Technology	$ 376	$ 966	$1196
Kinetic Energy Weapons Technology	$ 256	$ 860	$1239
Systems Concepts/Battle Management	$ 99	$ 243	$ 273
Survivability, Lethality, and Key Technologies	$ 112	$ 258	$ 317
General Management Support	$ 8	$ 9	$ 10
Total	$1397	$3722	$4908

*Some rounding occurs.

APPENDIX A

THE STRATEGIC DEFENSE INITIATIVE (SDI) AND THE ALLIES

A.1 CONSULTATIONS WITH ALLIES ON SDI

A.1.1 CONGRESSIONAL REPORTING REQUIREMENT

The following addresses the Conference Armed Services Committee Report request on "...the status of consultations with other member nations of the North Atlantic Treaty Organization, Japan, and other appropriate Allies concerning research being conducted in the Strategic Defense Initiative Program."

Additionally, the House Armed Services Committee Report (98-691) requested that the Secretary of Defense review the feasibility of establishing a liaison committee with the Allies to coordinate strategic defense efforts. Noting "that since the Strategic Defense Initiative has generated world-wide interest," the Committee "...directs the Secretary of Defense to explore the feasibility of establishing a liaison committee to serve as a communication link between the U.S. strategic defense program and the U.S. Allies, with emphasis on coordination and sharing of strategic defense efforts."

A.1.2 STRUCTURE

The U.S. has maintained extensive contacts with its Allies on the Strategic Defense Initiative. Section A.1 outlines the various consultations that have occurred with Allied officials and discusses, inter alia, various consultative efforts planned for the future. In light of these activities Section A.1.9 then evaluates the House Armed Services Committee proposal for establishing a liaison committee.

A.1.3 PRESIDENT REAGAN'S MARCH 1983 SPEECH

On March 23, 1983, President Reagan announced his aspiration of rendering ballistic missiles "impotent and obsolete". His speech inaugurated a major policy and technology review that led to a broad and intensive research program known as the Strategic Defense Initiative. In the speech, President Reagan was clear about the strong and unbreakable U.S. commitment to its Allies and his intention to consult with them regarding this important technology review.

> "As we pursue our goal of defensive technologies, we recognize that our Allies rely upon our strategic offensive power to deter attacks against them. Their vital interests and ours are inextricably linked--their safety and ours are one. And no change in technology can or will alter that reality. We must and shall continue to honor our commitments."
>
> "I clearly recognize that defensive systems have limitations and raise certain problems and ambiguities. If paired with offensive systems, they can be viewed as fostering an aggressive policy and no one wants that."

> "But with these considerations firmly in mind, I call upon the scientific community who gave us nuclear weapons to turn their great talents to the cause of mankind and world peace; to give us the means of rendering these nuclear weapons impotent and obsolete."
>
> "Tonight, consistent with our obligations under the ABM Treaty and recognizing the need for close consultation with our Allies, I am taking an important first step."

Concern for and recognition of Allied interests are thus a part of the SDI effort from its inception.

A.1.4 INITIATION OF CONSULTATION

As a result of the President's speech, the two major government studies were conducted during the summer and fall of 1983 to evaluate the technical and policy implications of advanced defense against ballistic missiles. The policy study in particular examined whether and how advanced ballistic missile defenses might fit in NATO's strategy of flexible response. The studies confirmed that an effective defense against ballistic missiles could enhance U.S. and Allied deterrence and security, and that such defenses would be fully consistent with Alliance strategy. Based on the results of these studies, the President in establishing the SDI research effort, directed that consultations be held with the Allies on SDI. Thus, from the beginning of the study efforts, the U.S. has sought to ensure first that Allied interests and concerns were an integral part of the approach, and, secondly, that members of NATO and other Allies of the United States were, and remain fully aware of U.S. thinking. As the U.S. embarked on this research program, it was recognized that it was of the highest importance that the U.S. and its Allies work together on understanding the policy and technical implications of those developments for deterring both nuclear and conventional aggression.

We have been consistent in meeting the concerns of the Allies directly--at all levels of the Allied governments--by providing the Allies the U.S. view of the political, military and technological basis for SDI. The following section illustrates some of the many consultations the U.S. Government has conducted on the Strategic Defense Initiative with the Allies beginning in 1984.

A.1.5 MULTILATERAL CONSULTATIONS

a. Briefing Teams to Allied Capitals

Following President Reagan's decision on Allied consultations embodied in a Presidential Decision Directive, Administration briefing teams were sent to the capitals of Allies in Western Europe and the Pacific. The interagency teams were composed of officials from the Office of the Secretary of Defense, the Organization of the Joint Chiefs of Staff, the Department of State, and the Arms Control and Disarmament Agency. The European team briefed NATO Allies during early February 1984. The Pacific team visited Ottawa before traveling to Tokyo, Canberra and Wellington. As a preliminary step, Allied

military attaches in Washington were presented with a briefing in order to ensure that they were informed and to provide them an opportunity to pass preliminary views to their governments in the interest of facilitating discussions with U.S. representatives.

The Allies were presented a three-part briefing covering the scope of the Soviet efforts in both conventional ABM capabilities and advanced ABM technologies, the results of U.S. study of the policy implications of SDI and the dimensions of the U.S. technology research and development program.

b. Ministerial Session at the Nuclear Planning Group

At the Nuclear Planning Group[1] (NPG) Ministerial session in Cesme, Turkey, 3-4 April 1984, the United States presented a briefing on the policy and technology aspects of SDI.

Secretary Weinberger assured the Allies that the United States fully intended to continue consultations, noting that the briefing at the NPG and earlier briefings in the Alliance were evidence of U.S. efforts. The Secretary stressed that he would welcome Allied technical participation as this could make significant contributions to the SDI program.

c. NATO Military Committee Briefing

Officials of the U.S. government provided a similar policy and technology briefing to a plenary session of NATO's Military Committee[2] in July 1984.

d. North Atlantic Council and High Level Group Meeting

In July 1984, high ranking U.S. government officials met with the permanent representatives of the North Atlantic Council[3] and NATO's High Level Group[4] to discuss SDI. The discussion focused on the origin and purpose of SDI, implications for deterrence and arms control and the potential benefits for the Allies.

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[1]The Nuclear Planning Group (with representatives of all the NATO nations except for France and Iceland) meets at either the level of Defense Ministers or Permanent Representatives.

[2]The Military Committee is the highest military authority in NATO. Member nations are represented usually by their Chief of Staff or his permanent designated representative (except for France which is represented by a military mission and Iceland which can be represented by a civilian since it has no military forces).

[3]The North Atlantic Council is comprised of permanent representatives of Ambassador rank appointed by 16 NATO nations.

[4]The High Level Group is comprised of senior level officials from the member nation's Ministries of Defense.

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e. North Atlantic Council Meeting

In February 1985, an interagency team briefed a morning and afternoon session of the North Atlantic Council's permanent representatives. The briefings included the Soviet efforts in research and development of defenses against ballistic missiles and a programmatic briefing on the SDI program.

A.1.6 OTHER CONSULTATION EFFORTS

In addition to the high visibility consultations which have occurred in both multilateral and bilateral fora, there have been continuous U.S. efforts to meet with the Allies at the mid-level when representatives of Allied nations come to the United States.

A.1.7 CONSULTATIONS ON TECHNOLOGY COOPERATION

Over the next several years, the U.S. will work closely with its Allies to ensure that, in the event of any future decision to deploy defensive systems (a decision in which consultation with the Allies will play an important part), Allied as well as United States security against aggression would be enhanced.

Moreover, the United States will, consistent with existing international obligations including the ABM Treaty, proceed with cooperative research with the Allies in areas of technology that could contribute to the SDI research program. Pursuant to this policy, the United States is permitted--and is prepared--to undertake such cooperative programs on data and technology short of ABM component level as may be mutually agreed with Allied countries.

With respect to SDI, the United States will not seek to arrange for the Allies to do for the U.S. what it cannot do under the Treaty. Of course, exchanges with the Allies concerning defensive systems not covered by the ABM Treaty can continue as desired by the United States and its Allies.

A.1.8 FUTURE CONSULTATIVE EFFORTS

The United States intends to continue an active dialogue with Allies on the range of policy and technical issues relating to SDI. Numerous formal and informal meetings are expected to be held over the next several months.

A.1.9 FEASIBILITY OF ALLIED LIAISON COMMITTEE

This report's description of numerous consultations which have occurred with the Allies since President Reagan announced his research program and the many consultative efforts planned for the future makes clear that the U.S. has a very active diplomatic effort underway on the SDI. It is believed that this representative sample, though not exhaustive, demonstrates that the Administration's efforts to consult with the Allies have been concerted and responsive to the concerns of the Allies themselves.

The formal multilateral mechanisms through which consultations were conducted have served as satisfactory consultative fora, particularly for the

discussion of political matters. These formal mechanisms include the North Atlantic Council, Nuclear Planning Group, High Level Group, Committee for National Armament Directors (CNAD), and the NATO Advisory Group for Aerospace Research and Development (AGARD). Since these groups are existing entities within the NATO structure, they provide established mechanisms through which NATO can hold regular meetings to discuss issues confronting the Allies. SDI has been and will continue to be a topic at those meetings. It is believed, therefore, that any additional mechanisms established would constitute an unnecessary bureaucratic layer.

These existing formal mechanisms and informal and formal bilateral discussions with Allied officials have permitted consultations with mid- to senior-level officials including individuals interested in both policy and technology issues.

The U.S. will continue to use these mechanisms to keep its Allies fully informed on its discussions with the Soviet Union on SDI-related matters, including the on-going negotiations in Geneva.

Since the SDI has implications that touch numerous aspects of Allied relations, the establishment of a single, new mechanism for Allied consultation on SDI would have a constraining--rather than facilitating--effect on such necessary consultation.

In the area of technology, bilateral discussions are important to determine the degree to which Allied technical and scientific assistance could contribute to the SDI program. Regularly scheduled, formal, multilateral meetings would be inappropriate fora for Allied technical participation due to the diversity of scientific and technical expertise of the Allies in SDI-related technologies. Additionally, setting up such a group would stifle the free flow of ideas necessary to scientific progress while at the same time creating a ponderous bureaucratic infrastructure that could consume funds without providing any technical results.

In conclusion, the Administration believes that a liaison committee for communication and coordination with the Allies on SDI is unnecessary and potentially counterproductive. It is firmly believed that this report reflects the concerted efforts over the past two years to consult closely with its Allies on SDI-related matters. The U.S. will continue to consult with its Allies on a regular basis on all issues that arise while research efforts are continued in support of the President's Strategic Defense Initiative.

A.2 EFFECT OF THE STRATEGIC DEFENSE INITIATIVE ON U.S. ALLIES

A.2.1 CONGRESSIONAL REPORTING REQUIREMENT

This section deals with the Congressional request on "...the strategic military and budgetary impact on our Allies of the Strategic Defense Initiative and related programs, including the impact of the possible deployment of Soviet missile defense on the viability of the independent nuclear forces of our Allies and other countries as well as on American policies and capabilities relative to our extended deterrence posture."

A.2.2 NATO'S FLEXIBLE RESPONSE POLICY AND SDI

Since its founding in 1949, the primary objective of the NATO Alliance has been to maintain the independence and territorial integrity of its member states by deterring aggression. While this objective has never been altered, changes in the military balance and the threat the Alliance has faced from the Soviet Union have, over the years, required periodic changes in the means by which it has been achieved.

In the years prior to Soviet acquisition of a substantial strategic nuclear capability, the U.S.'s overwhelming superiority in nuclear arms and the fact that U.S. vulnerability to Soviet nuclear attack was relatively low, meant that NATO could confidently deter Soviet nuclear or conventional aggression in Europe merely by threatening devastating U.S. nuclear retaliation against the Soviet Union. Because Soviet retaliatory options against the U.S. were limited, this policy was both simple and credible. But as Soviet strategic nuclear capability grew, this strategy became increasingly less credible.

Since 1967, the NATO Alliance's strategy to deter Soviet aggression has been based on the policy known as "flexible response". Described in NATO document MC 14/3, flexible response is based on the assumption that deterrence can best be maintained if the Alliance maintains the means--both conventional and nuclear--to respond flexibly to a wide range of potential Soviet military aggression.

Adoption of the flexible response strategy by NATO represented an acknowledgement that Soviet military capabilities, especially nuclear, had grown to such an extent that NATO's military doctrine no longer could be based solely on a U.S. threat of massive retaliation to deter all possible levels of Soviet aggression, both nuclear and conventional. This dictated a change in the way in which NATO deterred Soviet aggression. In the face of Soviet strategic nuclear equivalence, a growing arsenal of nuclear weapons capable of striking Western Europe from within the Soviet Union and Eastern Europe, and the conventional force superiority that the Soviet Union has traditionally enjoyed over NATO, the flexible response strategy called for the maintenance of a much broader mix of deterrent forces and capabilities. In the years since 1967, NATO has endeavored to develop and deploy the forces necessary to construct a "seamless web of deterrence"; that is, conventional and nuclear forces deployed in Europe and strategic nuclear forces, capable of acting together to deny the Soviet Union credible attack options, whether they be large-scale, limited, nuclear or conventional. This is the context in which the U.S. is modernizing its conventional forces and intermediate range and strategic nuclear forces.

But because Soviet capabilities through the 1970s and 1980s have not remained constant--their continuing increase in strategic nuclear intermediate-range nuclear, and conventional force capability relative to the West providing ever wider options for aggression--the challenges to NATO's security interests continue to mount. One of the central challenges to NATO's flexible response strategy is the Soviet Union's increasing intercontinental- and shorter-range ballistic missile capability. The growth of the Soviet Union's modern, accurate ballistic missile force has reached the point where it threatens NATO's ability to retaliate effectively to a potential Soviet

first-strike attack and has reduced the stability of the strategic environment.

Soviet SS-20s and other shorter-range ballistic missiles provide overlapping capabilities to initiate nuclear or conventional strikes throughout all of NATO Europe. Soviet doctrine includes the use of conventionally-armed ballistic missiles to initiate rapid and wide-ranging attacks on crucial NATO military targets throughout Europe, such as air fields, air defense sites, resupply ports, weapons and munitions storage sites, and C^{3}I and military headquarters facilities. The purpose of this tactic would be to reduce significantly NATO's ability to resist the initial thrust of a Soviet conventional force attack with conventional forces and to impede NATO's ability to resupply and reinforce its combatants from outside Europe. This is a serious and growing threat to the maintenance of a strong flexible response deterrent in Europe. But the threat does not end here. This ballistic missile capability also could be used to destroy quickly, at the onset of hostilities, European-based nuclear forces and storage facilities, further blunting NATO's flexible response capability.

An effective defense against ballistic missiles would offer a means of surmounting the Soviet ballistic missile challenge. Such defenses would increase significantly Soviet uncertainties regarding whether their weapons would penetrate the defenses and destroy crucial military targets. Lacking confidence in its ability to conduct a successful attack under these circumstances, the Soviet Union would be far less likely to contemplate such an attack, even during a crisis. By reducing or effectively eliminating the military utility of ballistic missiles, defenses also would reduce or eliminate the destabilizing threat of first-strike attack.

In effectively countering ballistic missile threats against the U.S., such defenses would strengthen the credibility of U.S. extended deterrence and NATO's flexible response strategy by reducing U.S. vulnerability to attack. But the contribution that ballistic missile defenses can make to flexible response does not end here. By reducing or eliminating the ability of shorter-range Soviet ballistic missiles to strike rapidly European NATO military assets essential to effective resistance to Soviet nuclear or conventional force aggression in Europe, such defenses also could enhance the ability of the U.S. to maintain an effective flexible response strategy in Europe. They thereby could increase deterrence against Soviet nuclear or conventional force attack in that region and strengthen the coupling between U.S. and NATO forces.

NATO always has been a defensive alliance, eschewing the aggressive use of force against other states and rejecting the deployment of military forces that could support an aggressive policy. Thus, SDI is more than just consistent with the military requirements of the Alliance. Because it embodies a defensive purpose, it also is consistent with the Alliance's defensive philosophy.

Just as deterrence against attacks directed at the U.S. and its European Allies could be enhanced by effective defenses against ballistic missiles, such defenses also would deter attacks against other important Allies of the United States. This is especially true of those Allies for whom Soviet ballistic missiles constitute the primary threat they face.

A.2.3 INDEPENDENT NUCLEAR DETERRENTS AND SDI

Related to the maintenance of deterrence in Europe today are the independent deterrent forces possessed by France and the United Kingdom. These forces, as well as those of the U.S., are potentially affected by on-going Soviet ballistic missile defense efforts.

While much of the Soviet effort in this area has been consistent with the ABM Treaty, one significant program--the construction of a large phased-array radar near Krasnoyarsk--constitutes a violation of a key provision of the Treaty. In addition, the Soviets also probably have violated the Treaty prohibition on testing SAM air defense components in an ABM mode by conducting concurrent operations of SAM and ABM components. Also the development of the new ABM system mentioned above, represents a potential violation of restrictions on mobile ABM components. The sum of Soviet activities suggests that the Soviet Union may be preparing an ABM defense of its national territory--an activity prohibited by the ABM Treaty.

The extent of the Soviet ballistic missile defense effort, the persistence of the effort (the Soviet program, including that part that is developing advanced ABM technologies, has been in existence for many years and substantially predates SDI), Soviet willingness to violate the ABM Treaty, and the fact that Soviet military doctrine places great emphasis on superior defensive capabilities of all types as well as on superior offensive forces, stand as convincing evidence that the Soviets are positioning themselves to deploy wide-spread ballistic missile defenses, should they deem such defenses to be in their interest. This inclination exists independent of U.S. ballistic missile defense activities and is largely unaffected by them.

Soviet doctrine and ballistic missile defense activities will have a continuing impact on French and United Kingdom nuclear forces as well as on those of the U.S., quite independent of SDI research efforts. In this regard, the presence of an active U.S. SDI research program may reduce substantially any inclination to break-out (or creep out) of the ABM Treaty. A break-out from the ABM Treaty would be useful to the Soviets in the long-term only if the benefits could be exploited unilaterally. An active SDI program would provide an effective hedge against such unilateral Soviet options.

A.2.4 BUDGETARY IMPLICATIONS

Beyond the question of the cost of the SDI research program itself (estimated to be approximately $26 billion over the next five years), the potential budgetary impact of SDI on the U.S. or its Allies, if defensive deployments are made, cannot be assessed at this time.

Also difficult to assess at this point, but with real potential budgetary and financial impact, is the degree to which the SDI research program will further our understanding of a wide range of technologies with general military and commercial application. Due in large part to the fact that these technologies could provide budgetary and financial benefits far beyond what one might otherwise expect from a military technology research program, many of the Allies have expressed an interest in active participation in the SDI program.

APPENDIX B

THE STRATEGIC DEFENSE INITIATIVE (SDI) AND THE ABM TREATY

B.1 COMPLIANCE OF THE STRATEGIC DEFENSE INITIATIVE WITH THE ABM TREATY

B.1.1 INTRODUCTION AND SCOPE

The following addresses "... the status, from the present year to completion, of each Program, Project and Task under the Strategic Defense Initiative and related programs with respect to compliance with the ABM Treaty." The likely need for modification to the ABM Treaty to proceed beyond the SDI research program is discussed. The existing process for ensuring compliance with Strategic Arms Limitation (SAL) Agreements, including organizational responsibilities and reporting processes and their application to SDI and the ABM Treaty, is also described.

The President's Strategic Defense Initiative, January 1985, makes clear that SDI is a research program. It states:

- "The President announced his Strategic Defense Initiative in his March 23, 1983, address to the nation. Its purpose is to identify ways to exploit recent advances in ballistic missile defense technologies that have potential for strengthening deterrence and thereby increasing our security and that of our Allies. The program is designed to answer a number of fundamental scientific and engineering questions that must be addressed before the promise of these new technologies can be fully assessed. The SDI research program will provide to a future President and a future Congress the technical knowledge necessary to support a decision in the early 1990s on whether to develop and deploy such advanced defensive systems."

- "As a broad research program, the SDI is not based on any single or preconceived notion of what an effective defense system would look like. A number of different concepts, involving a wide range of technologies, are being examined. No single concept or technology has been identified as the best or the most appropriate. A number of nonnuclear technologies hold promise for dealing effectively with ballistic missiles."

B.1.2 POLICY

There are three major points to be made regarding United States Policy on compliance with the ABM Treaty.

First, the SDI research program is being conducted in a manner fully consistent with all U.S. Treaty obligations. The President has directed that the program be formulated in a fully compliant manner and the DoD has planned and reviewed the program (and will continue to do so) to ensure that it remains compliant. Specifically, our review has found that the research necessary to support a decision on the potential utility of the SDI technology can be conducted in accordance with U.S. Treaty obligations.

Second, because there are gray areas that are not fully defined in the ABM Treaty, it is necessary in some cases to set additional standards to make certain that the U.S. is in compliance.* This review has been conducted using reasonable standards of U.S. compliance. Four of the more important working principles of this review are that:

- Compliance must be based on objective assessments of capabilities which support a single standard for both sides and not on subjective judgments as to intent which could lead to a double standard of compliance.

- The ABM Treaty prohibits the development, testing, and deployment of ABM systems and components that are space-based, air-based, sea-based, or mobile land-based. However, that agreement does permit research short of field testing of a prototype ABM system or component. This is the type of research that will be conducted under the SDI program.

- New technologies and devices should not be subjected to stricter standards than have evolved for existing systems.

- The ABM Treaty, of course, restricts defenses against strategic ballistic missiles; it does not apply to defenses against non-strategic ballistic missiles or cruise missiles.

Third, this report does not consider Soviet violations of the ABM Treaty. We do reserve the right to respond to those violations in appropriate ways, some of which may eventually bear on the Treaty constraints as they apply to the United States. The United States Government must guard against permitting a double standard of compliance, under which the Soviet Government would expect to get away with various violations of arms agreements while the U.S. continues to abide with all provisions.

B.1.3 OVERALL COMPLIANCE ASSESSMENT

The entire SDI research program as submitted in the FY 1986 authorization request is being conducted in compliance with the ABM Treaty. The SDI program consists of near-term technology research projects and longer-term technology experiments. The technology research projects directly support the experiments by providing the necessary technologies. These near-term technology research projects and tasks are well defined and clearly compliant. The major technology experiments to be conducted in later years are being planned to be fully compliant. These experiments are designed to demonstrate technical feasibility, that can be established without involving ABM systems or components or devices with their capabilities. Thus, compliant space-based as well as fixed land-based experiments are possible.

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* An example is the issue of components versus subcomponents. ABM components are defined in the Treaty as currently consisting of ABM missiles, launchers, and radars. Subcomponents, which are not limited by the Treaty are not defined by the Treaty.

The SDI research program can be conducted in a fully compliant manner to reach a decision point in the early 1990s on whether to proceed to development and deployment of an SDI-related system. The compliance evaluation process is an on-going one, as current programs become better defined, new programs are added, and some programs are eliminated or modified. Development and deployment, given a decision to proceed, would almost certainly require modifications to the ABM Treaty. The ABM Treaty provides for possible amendments at any time and five year review sessions during which possible changes can also be discussed. Also, Article XV (2) provides a right to withdraw from the Treaty. In this connection, during the negotiations Gerard Smith stressed the importance the U.S. Government attaches to achieving agreement on more complete limitations on strategic offensive arms following agreement on an ABM Treaty and the interim SALT Agreement. He stated:

> "If an agreement providing for more complete strategic offensive arms limitations were not achieved in five years, U.S. supreme interests could be jeopardized. Should that occur, it would constitute the basis for withdrawal from the ABM Treaty."

B.1.4 EXISTING COMPLIANCE PROCESS FOR SDI

DoD has in place an effective compliance process (established in 1972 after the signing of the SALT I agreements), under which key offices in DoD are responsible for overseeing and will continue to oversee SDI compliance with all existing strategic arms control agreements. Under this process the SDIO, the relevant Agencies and Services ensure that the implementing program offices adhere to DoD Compliance Directives and guidelines.

Specific responsibilities are assigned by DoD Directive 5100.70, 9 January 1973, Implementation of SAL Agreements. The Under Secretary of Defense for Research and Engineering (USDRE) ensures that all DoD programs are in compliance with existing SAL agreements. The Service Secretaries, Chairman JCS and Agency Directors ensure the internal compliance of their organizations. The DoD General Counsel provides advice and assistance with respect to the implementation of the compliance process and interpretation of SAL agreements.

DoD Instruction S-5100.72 establishes general instructions, guidelines, and procedures for ensuring the continued compliance of all DoD programs with the existing agreements. Under these procedures questions of interpretation of specific agreements are to be referred to the USDRE to be resolved on a case-by-case basis. No project or program which reasonably raises an issue as to compliance can enter into the testing, prototype construction, or deployment phases without prior clearance from the USDRE. If such a compliance issue is in doubt, USDRE approval shall be sought. In conjunction with the DoD General Counsel, the USDRE applies the provisions of the agreements, as appropriate. Military departments and DoD Agencies are to certify internal compliance quarterly and establish internal procedures and offices to monitor and ensure internal compliance.

As a new agency, SDIO was instructed to submit quarterly reports certifying its compliance and to monitor its projects, as required of other DoD Agencies. The Services are to ensure that SDI projects under their

auspices are monitored and implemented in a Treaty compatible manner. They are to include SDI compliance in the quarterly reports they submit under DODI S-5100.72.

B.1.5 CATEGORIES OF TREATY COMPLIANT ACTIVITIES

There are three basic types of activity that are permitted in compliance with the ABM Treaty. The SDI major experiments described in a later section have been classified according to these categories.

Category 1 - Conceptual Design or Laboratory Testing. This activity precedes "field testing" and was considered during the ABM Treaty negotiations to be research that was not verifiable by National Technical Means (NTM) and that was not subject to Treaty limits. In testimony provided to the Senate Armed Services Committee in 1972, Gerard Smith presented the following statement:

> "The SALT negotiating history clearly supports the following interpretation. The obligation not to develop such systems, devices, or warheads would be applicable only to that stage of development which follows laboratory development and testing. The prohibitions on development contained in the ABM Treaty would start at that part of the development process where field testing is initiated on either a prototype or breadboard model. It was understood by both sides that the prohibition on 'development' applies to activities involved after a component moves from the laboratory development and testing stage to the field testing stage, wherever performed. The fact that early stages of the development process, such as laboratory testing, would pose problems for verification by National Technical Means is an important consideration in reaching this definition. Exchanges with the Soviet Delegation made clear that this definition is also the Soviet interpretation of the term 'development'."

Category 2 - "Field Testing" of Devices that Are Not ABM Components or Prototypes of ABM Components. As noted earlier, Article V prohibits the development, testing, and deployment of ABM systems or components that are space-based, sea-based, air-based, or mobile land-based.

The Smith statement shows it was clear in 1972 that "development" begins when "field testing" is initiated on either a "breadboard model" or "prototype" of an ABM component. This definition of "development" was used as a basis of ratification by the Senate and has been used as a U.S. Government standard for the last thirteen years. The definition of "development" coupled with Article V led to the prohibition on "field testing" of "ABM systems" and "components", or their "prototypes" and "breadboard models", which are other than fixed land-based. SDI "field tests" of space- or other mobile-based devices cannot involve ABM "components" or "prototypes" or "breadboard models" thereof. All SDI Cateogry 2 experiments must meet this criteria.

"ABM systems and components" are defined in Article II as follows:

> "For the purpose of this treaty an ABM system is a system to counter strategic ballistic missiles or their elements in flight trajectory, currently consisting of: (a) ABM interceptor missiles, which are interceptor missiles constructed and deployed for an ABM role, or of a type tested in an ABM mode; (b) ABM launchers, which are launchers constructed and deployed for launching ABM interceptor missiles; and (c) ABM radars, which are radars constructed and deployed for an ABM role, or of a type tested in an ABM mode."

No space-based, air-based, sea-based or mobile land-based launchers, interceptors, and radars may be "tested in an ABM mode". Toward this end, an interceptor missile is considered to be "tested in an ABM mode" if it has attempted to intercept (successfully or not) a strategic ballistic missile or its elements in flight. Likewise a radar is considered to be "tested in an ABM mode", if it performs certain functions such as tracking and guiding an ABM interceptor missile or tracking strategic ballistic missiles or their elements in flight in conjunction with an ABM radar which is tracking and guiding an ABM interceptor missile. "Strategic ballistic missiles or their elements in flight" include ballistic target-missiles with the flight characteristics of strategic ballistic missiles or their elements over the portions of the flight involved in testing.

Category 2 experiments must also meet the obligation of Article VI not to give non-ABM launchers, missiles, or radars the capability to counter strategic ballistic missiles or their elements in flight trajectory. Allowed Category 2 activities include tests of experimental devices to demonstrate technical feasibility and gather data prior to reaching the stage of prototype or breadboard model of an actual ABM component or weapon system. Tests of ABM sub-components and non-ABM systems performing functions consistent with Treaty obligations (such as air defense and early warning) are also legitimate Category 2 activities.

Category 3 - "Field Testing" of Fixed Land-Based ABM Components. "Field Testing" of fixed land-based ABM components or systems is permitted as long as other Treaty provisions are met. Under Article IV all tests must take place at agreed ABM test ranges (for the U.S., White Sands Missile Range and Kwajalein Missile Range) and the total test launcher count must not exceed 15. Paragraph 2 of Article V addresses limits on launcher capabilities as follows:

> "Each party undertakes not to develop, test, or deploy ABM launchers for launching more than one ABM interceptor missile at a time from each launcher, nor to modify deployed launchers to provide them with such a capability, nor to develop, test, or deploy automatic or semi-automatic or other similar systems for rapid reload of ABM launchers."

An Agreed Statement adds the prohibition on "delivery by each ABM interceptor missile of more than one independently guided warhead" to Article V.

Summary. The SDI projects and experiments have been reviewed to ensure that they will be implemented in accordance with one of the three categories of treaty compliant activities. The Services and the SDIO are obligated to plan and implement them in a compliant manner. In this assessment many of the SDI devices do not use traditional technology, but are "based on other physical principles" (such as lasers). In these cases they were reviewed by considering their capability to substitute for traditional ABM components, whether they will be "tested in an ABM mode" by analogy to the requirement for interceptors, launchers, and radars, and the intended use of the device in the experiment.

B.1.6 COMPLIANCE ASSESSMENT

The entire SDI program has been reviewed for compliance with the ABM Treaty. The bulk of the near-term effort consists of technology research efforts that support the fifteen major experiments to be conducted by the SDI Program. These technology research projects have been reviewed for compliance. The fifteen major experiments and their basis for compliance (ten are in Category 1 or 2 and five are in Category 3) are summarized below:

Category 1 and 2 Major Experiments. The ten experiments in these two categories involve devices that are not ABM components or prototypes thereof. These include the four Directed Energy Weapon (DEW)-related experiments and six Surveillance, Acquisition, Tracking and Kill Assessment (SATKA) and Kinetic Energy Weapons (KEW) experiments.

The four Directed Energy Weapon experiments are the ALPHA/LODE/LAMP, TALON GOLD replacement, integration of a high powered laser and optical devices, and the Ground-Based Laser Uplink. The Surveillance, Acquisition, Tracking and Kill Assessment projects include the Boost Surveillance and Tracking System Experiment, the Space Surveillance and Tracking System Experiment, and the Airborne Optical Adjunct Experiment. The Kinetic Energy Weapons projects include Space-Based Kinetic Kill Vehicles Experiment and land-based and space-based Electromagnetic Railgun Experiments.

ALPHA is a ground-based laser device designed to explore the potential of chemical lasers for space-based applications. The Large Optics Demonstration Experiment (LODE) and LODE Advanced Mirror Program (LAMP) are to demonstrate critical beam control and optics technologies, respectively, in a series of ground-based experiments. The LODE/LAMP mirror is to be integrated with a high power chemical laser using LODE beam control technology in the late 1980s. All of these tests are under-roof experiments using devices incapable of achieving ABM performance levels. (Category 1)

The newly constituted Acquisition, Tracking and Pointing (ATP) demonstration program replacing Talon Gold will concentrate on a series of ground-based, laboratory-level experiments in the near term. In these experiments, brassboard hardware built under the TALON GOLD project will demonstrate, with increasing degrees of difficulty, technologies required for ATP of weapons and sensors for space- and ground-based applications. In the future, the measurement of booster plumes from space is a distinct possibility. The previously designed pointer may be built for use as a stable platform for

such experiments with passive sensors in the Shuttle bay. If conducted these experiments will use technologies which are only part of the set of technologies ultimately required for an ABM component. These devices will also not be capable of achieving ABM performance levels. Follow-on experiments may make use of the shuttle to explore pointing and tracking technology. When they are defined, they will be reviewed to ensure they are in compliance. (Category 1/2)

Laser and optical subsystems from other programs will be integrated into an experimental device for ground-based testing against ground-based static targets at the White Sands Missile Range. This will demonstrate, in a ground test, the efficient integration of important subsystems, which (separated or in whole) are not ABM components or prototypes and are not capable of being based in space. The power, optics, and laser frequency are not compatible with atmospheric propagation at ranges useful for ABM applications. Tests are not planned against missiles or their elements in flight. (Category 2)

The Ground-Based Laser Uplink experiment is for atmospheric propagation experiments using a treaty compliant ground-based laser. The testing mode and capabilities are below the power level and beam quality required for a ground-based laser ABM weapon, and testing will not include strategic ballistic missiles or their elements in flight. (Category 2)

The Boost Surveillance and Tracking System (BSTS) Experiment is a space-based experiment (which is not fully defined) to demonstrate technology capable of upgrading the current satellite early warning system. This experiment will, if successful, also permit a decision to be made on the applicability of more advanced technology for ABM purposes. The BSTS experimental device will not be a prototype of an ABM component. The BSTS experimental device will be limited in capability so that it cannot substitute for an ABM component, but will be capable of performing early warning functions. For example, the experimental devices may measure the signatures of booster plumes, but not in real time. Other capabiliites may be limited as well. (Category 2)

The space-based Space Surveillance and Tracking System Experiment (which is not fully defined) is to demonstrate technology capable of upgrading the current space surveillance assets and will also permit a decision to be made on the applicability of more advanced technology for ABM purposes. This experiment will demonstrate the collection of tracking and signature data on a number of space objects. The capabilites of any demonstration satellites will be significantly less than those necessary to achieve ABM performance levels or substitute for an ABM component. (Category 2)

The Airborne Optical Adjunct (AOA) Experiment will demonstrate the technical feasibility of using optical sensors on an airborne platform (late 1980s). The AOA experimental device (a passive sensor) will not be capable of substituting for an ABM component due to sensor and platform limitations. As part of the feasibility demonstration, the AOA experimental device is to observe ballistic missile tests at agreed ABM Test Ranges. (Category 2)

The purpose of the space-based Kinetic Kill Vehicle project (which is not fully defined) is to prove the feasibility of rocket propelled projectile launch and guidance. This experiment will, if successful, demonstrate a capability to defend against anti-satellite interceptors and will also permit a decision to be made on the applicability of more advanced technology for ABM purposes. The demonstration hardware will not be an ABM component, will not be "capable of substituting for an ABM component" and will not be "tested in an ABM mode". To ensure compliance with the ABM Treaty the performance of the demonstration hardware will be limited to the satellite defense mission. Intercepts of certain orbital targets simulating anti-satellite weapons can clearly be compatible with this criteria. Intercepts of strategic ballistic missiles or their elements in flight would clearly not be permitted. (Category 2)

The Ground-Based Railgun Experiment (which is not fully defined) is intended to validate the potential of devices of this type. Several types of projectiles will be fabricated to demonstrate that they can be successfully launched from these guns. The test devices will not be ABM components and will not have ABM capabilities. They will demonstrate the capability to launch unguided and guided projectiles and will not involve "testing in an ABM mode". (Category 1)

The space-based Railgun Experiment (which is not fully defined) will demonstrate space-based operation of a railgun device. In addition to showing that devices of this type can operate in space, these experiments will demonstrate guidance and control of projectiles. This experiment will, if successful, demonstrate a capability to defend against anti-satellite interceptors and will also permit a decision to be made on the applicability of more advanced technology for ABM purposes. Specific performance parameters for the experiments will be established to satisfy Treaty compliant guidelines. (Cateogry 2)

Category 3 Experiments. Five of the planned experiments involve tests of fixed ground-based "ABM components" at an identified ABM Test Range.

The High Endoatmospheric Defense Interceptor (HEDI) project is to demonstrate the capability to intercept and negate strategic ballistic missile warheads within the atmosphere. This is an allowed test of a nonnuclear interceptor missile. Flight tests will be performed at agreed test ranges. All flight tests will be from fixed ground-based launchers without the capability of being rapidly reloaded or launching more than one interceptor missile. The interceptor missiles will not be capable of delivering more than one independently targetable warhead. All activity will be conducted in a manner permitted by the ABM Treaty. (Category 3)

The Exoatmospheric Reentry-Vehicle (RV) Interceptor Subsystem (ERIS) is intended to engage incoming RVs above the atmosphere. This is an allowed test of a nonnuclear interceptor missile. All interceptor missile flight tests are to be conducted from fixed ground-based launchers at agreed test ranges. The planned flight tests include missile integrity launches and various homing and intercept flights with and without targets. Fixed ground-based launchers will be incapable of launching more than one interceptor missile and will not be rapidly reloadable. The ERIS interceptor missile will

not be capable of delivering more than one independently targetable warhead. (Category 3)

The Terminal Imaging Radar (TIR) will be an ABM radar "tested in the ABM mode" in full compliance with the terms of the ABM Treaty. It will be tested at a designated ABM test range from a fixed, land-based platform. TIR will be permanently installed in an existing radar building and will require this building for structural support. TIR will perform target pre-commit discrimination and handover to the interceptor missiles. (Category 3)

The Long Wavelength Infrared (LWIR) Probe is planned to use a ground-launched, LWIR sensor in a feasibility demonstration experiment. All tests will be conducted from a fixed, land-based launcher at an agreed test range. If LWIR Probe (after it is better defined) is considered an ABM component, it must be fixed, land-based and be tested only at agreed test ranges. (Category 3)

The integrated demonstration will validate the integrated capability of the Terminal Imaging Radar, High Endoatmospheric Nonnuclear Interceptor, and associated Command, Control, and Communications systems to perform terminal defense engagements. In this demonstration, strategic ballistic missiles will be intercepted in flight. This is permitted under the Treaty provided that the "ABM components" are fixed, land-based and provided that multiple launch, rapidly reloadable and independently guided warhead restrictions are met. Flight tests of ABM interceptor missiles are to be conducted at agreed test ranges from fixed ground-based launchers. (Category 3)

APPENDIX C

THE STRATEGIC DEFENSE INITIATIVE (SDI) AND OTHER STRATEGIC DEFENSE ACTIVITIES

C.1 SOVIET STRATEGIC DEFENSIVE CAPABILITIES

C.1.1 CONGRESSIONAL REPORTING REQUIREMENTS

The following deals with the Congressional requirement for a report on "...the current and future responsibilities of Soviet strategic defense forces, including ballistic missiles, space and air defense systems (including space-based and directed energy weapons and components), strategic anti-submarine warfare, internal defense and civil defense measures, and the political, military, strategic and budgetary implications of these forces for the United States and its Allies."

C.1.2 IMPLICATIONS OF SOVIET DEFENSIVE MEASURES

The implications of Soviet defensive measures for the viability of U.S. and Allied deterrent capability are great. With an extensive Soviet air and civil defense capability already in existence--a capability that is continually being upgraded, both quantitatively and qualitatively--and an extensive program to harden their ICBM silos (far above the strength of Minuteman silos), launch facilities and key C^3 and leadership bunkers, the Soviets are well on their way toward establishing a credible active and passive defense capability. These developments are particularly meaningful when viewed in conjunction with the extensive Soviet build-up of modern, accurate ballistic missiles of both intercontinental and shorter-range that are being deployed in numbers sufficient to convey a first-strike capability. It is to redress the imbalance created by these Soviet efforts that the U.S. is pursuing its strategic- and intermediate-range modernization programs.

The Soviet Union has long maintained an extensive ballistic missile defense research, development and deployment program. This program includes: new ABM deployments near Moscow including deployment of improved long-range and new short-range interceptor missiles and a new sophisticated radar; development of components for a new ABM system, designed to be deployable at sites requiring little or no preparation, and that could support a breakout from the ABM Treaty should the Soviets choose to do so; development of a new air defense missile system, the SA-X-12, which is both a tactical surface-to-air missile (SAM) and an antitactical ballistic missile and which may have the potential to intercept some types of intercontinental-range ballistic missiles; and research and development on advanced weapons technologies--such as lasers and neutral particle beams--with application to ballistic missile defense, as well as antisatellite systems.

If the Soviet Union were to develop and deploy an effective defense against ballistic missiles, in conjunction with its continually improving air and civil defenses, and if the U.S. and its Allies did not have similar options to exercise in response, deterrence of Soviet aggression would be very seriously undermined. This point is too clear to require elaboration.

Because of the importance that Soviet doctrine attaches to defensive forces and the fact that arms control cannot necessarily be seen as a useful means of diverting Soviet effort away from further work on ballistic missile defense, it is essential, at the very least, that the U.S. conduct an extensive research program into the potential of advanced technologies to negate the military effectivenss of ballistic missiles. Failure to do so will submit the United States and its Allies to the adverse consequences of a critical emerging deterrence imbalance.

The budgetary implications of the Soviet efforts depend significantly on whether and when the Soviet Union might decide to exploit the advances being made as a result of its research and development programs. However, for the near term, the budgetary implications are limited primarily to the expenditure the U.S. plans to make on the SDI research program over the next several years and those on-going expenditures associated with the U.S. program that are designed to maintain the effectiveness of the strategic Triad. The new expenditures associated with the SDI program are expected to amount to approximately $26 billion over the next five years. This spending will not affect funding for the strategic and intermediate nuclear forces and the conventional forces to the maintenance of an effective deterrent.

For the longer term, in the event the U.S. and its Allies, and the Soviet Union were to decide to begin to deploy defenses against ballistic missiles, cost savings from otherwise necessary ballistic missile forces' modernization in the next century could help offset the cost of ballistic missile defense deployments. Also, to the extent that meaningful reductions in ballistic missile forces can be achieved, total ballistic missile defense costs could be reduced.

The most recent unclassified description of Soviet strategic defense and space programs is to be found in Chapter III of Soviet Military Power (U.S. Government Printing Office, 1985), and is repeated here for the reader's convenience.

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Excerpt from Soviet Military Power, 1985
Concerning Soviet Strategic Defense and Space Capabilities

Chapter III
Strategic Defense and Space Programs

Strategic defenses are vital to the overall Soviet strategy for nuclear war. The operations of Soviet defensive and attack forces, as noted in Chapter II, are closely coupled; attack strategies are geared in large part to the reduction of the defensive burden. In the Soviet concept of a layered defense, effectiveness is achieved through multiple types of defensive capabilities compensating for shortcomings in individual systems and for the likelihood that neither offensive strikes nor any one layer of defense will stop all attacking weapons. The Soviets are making major improvements in their deployed strategic defenses and are investing heavily in ABM-related developments.

Soviet Military Power 1983 and 1984 outlined the continuing expansion into space of the Soviet drive for military superiority. In the past year, some 80 percent of Soviet space launches have been purely military in nature, with much of the remainder serving both military and civil functions. This is an increase from 70 percent in previous years. The Soviet military space program dominates the USSR's overall space effort. Soviet military doctrine establishes requirements for the military space program.

Laser/Energy Weapons Systems

Soviet directed-energy development programs involve future Ballistic Missile Defense (BMD) as well as antisatellite and air-defense weapons concepts.

By the late 1980s, the Soviets could have prototypes for ground-based lasers for ballistic missile defense. Testing of the components for a large-scale deployment system could begin in the early 1990s. The many difficulties in fielding an operational system will require much development time, and initial operational deployment is not likely in this century. However, with high priority and some significant risk of failure, the Soviets could skip some testing steps and be ready to deploy a ground-based laser BMD by the early-to-mid-1990s.

Ground- and space-based particle beam weapons for ballistic missile defense will be more difficult to develop than lasers. Nevertheless, the Soviets have a vigorous program underway for particle beam development and could have a prototype space-based system ready for testing in the late 1990s.

The Soviets have begun to develop at least three types of high-energy laser weapons for air defense. These include lasers intended for defense of high-value strategic targets in the USSR, for point defense of ships at sea, and for air defense of theater forces. Following past practice, they are likely to deploy air defense lasers to complement, rather than replace, interceptors and surface-to-air missiles (SAMs). The strategic defense laser is probably in at least the prototype stage of development and could be operational by the late 1980s. It most likely will be deployed in conjunction with SAMs in a point defense role. Since the SAM and laser systems would have somewhat different attributes and vulnerabilities, they would provide mutual support. The shipborne lasers probably will not be operational until after the end of the decade. The theater force lasers may be operational sometime sooner and are likely to be capable of structurally damaging aircraft at close ranges and producing electro-optical and eye damage at greater distances.

The Soviets are also developing an airborne laser. Assuming a successful development effort, limited initial deployment could begin in the early 1990s. Such a laser platform could have missions including antisatellite operations, protection of high-value airborne assets, and cruise missile defense.

The Soviets are working on technologies or have specific weapons-related programs underway for more advanced antisatellite systems. These include

space-based kinetic energy, ground- and space-based laser, particle beam, and radiofrequency weapons. The Soviets apparently believe that these techniques offer greater promise for future antisatellite application than continued development of ground-based orbital interceptors equipped with conventional warheads. The Soviets also believe that military applications of directed-energy technologies hold promise of overcoming weaknesses in their conventional air and missile defenses.

The USSR's high-energy laser program, which dates from the mid-1960s, is much larger than the US effort. They have built over a half-dozen major R&D facilities and test ranges, and they have over 10,000 scientists and engineers associated with laser development. They are developing chemical lasers and have continued to work on other high-energy lasers having potential weapons applications--the gas dynamic laser and the electric discharge laser. They are also pursuing related laser weapon technologies, such as efficient electrical power sources, and are pursuing capabilities to produce high-quality optical components. They have developed a rocket-driven magneto-hydrodynamic (MHD) generator which produces 15 megawatts of short-term electric power--a device that has no counterpart in the West. The scope of the USSR's military capabilities would depend on its success in developing advanced weapons, including laser weapons for ballistic missile defense.

The Soviets have now progressed beyond technology research, in some cases to the development of prototype laser weapons. They already have ground-based lasers that could be used to interfere with US satellites. In the late 1980s, they could have prototype space-based laser weapons for use against satellites. In addition, ongoing Soviet programs have progressed to the point where they could include construction of ground-based laser antisatellite (ASAT) facilities at operational sites. These could be available by the end of the 1980s and would greatly increase the Soviets' laser ASAT capability beyond that currently at their test site at Sary Shagan. They may deploy operational systems of space-based lasers for antisatellite purposes in the 1990s, if their technology developments prove successful, and they can be expected to pursue development of space-based laser systems for ballistic missile defense for possible deployments after the year 2000.

Since the early 1970s, the Soviets have had a research program to explore the technical feasibility of a particle beam weapon in space. A prototype space-based particle beam weapon intended only to disrupt satellite electronic equipment could be tested in the early 1990s. One designed to destroy satellites could be tested in space in the mid-1990s.

The Soviets have conducted research in the use of strong radiofrequency (RF) signals that have the potential to interfere with or destroy components of missiles, satellites, and reentry vehicles. In the 1990s, the Soviets could test a ground-based RF weapon capable of damaging satellites.

Soviet programs for the development and application of directed energy technologies to strategic defense have been very vigorous in the past and will continue to be so in the future, irrespective of what the US does about new strategic defense initiatives.

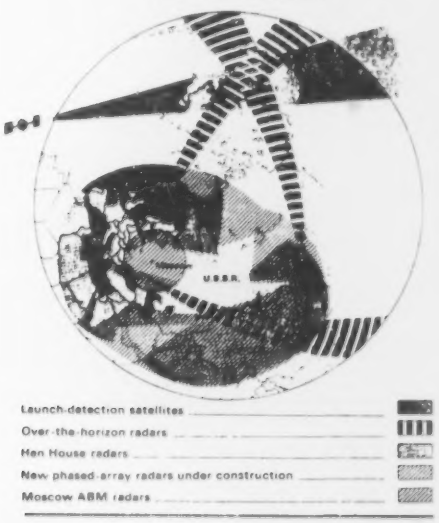
In the area of kinetic energy weapons, using the high-speed collision of a small mass with the target as the kill mechanism, the Soviets have a variety of research programs underway. These programs could result in a near-term, short-range, space-based system useful for satellite or space station defense or for close-in attack by a maneuvering satellite. Longer range, space-based systems probably could not be developed until the mid-1990s or even later.

Early Warning

The Soviets maintain the world's most extensive early warning system for both ballistic missile and air defense. Their operational ballistic missile early warning system includes a launch-detection satellite network, over-the-horizon radar, and a series of large phased-array radars located primarily on the periphery of the USSR. Their early warning air surveillance system is composed of an extensive network of ground-based radars linked operationally with those of their Warsaw Pact allies.

The current Soviet launch-detection satellite network is capable of providing about 30 minutes warning of any US ICBM launch and of determining the general area from which it originated. The two over-the-horizon radars the Soviets have directed at the US ICBM fields also could provide them with 30 minutes warning of an ICBM strike launched from the United States, but with somewhat less precision than the satellite network. Working together, these two early warning systems can provide more reliable warning than either working alone.

Coverage of Ballistic Missile Detection and Tracking Systems



The next layer of operational ballistic missile early warning consists of 11 large HEN HOUSE detection and tracking radars at six locations on the periphery of the USSR. These radars can distinguish the size of an attack, confirm the warning from the satellite and over-the-horizon radar systems, and provide target-tracking data in support of antiballistic missile (ABM) deployments.

Current Soviet air surveillance radar deployments include more than 7,000 radars of various types located at about 1,200 sites. These deployments provide virtually complete coverage at medium-to-high altitudes over the USSR and in some areas extend hundreds of kilometers beyond the borders. Moreover, the over-the-horizon radars provide additional warning of the approach of high-flying aircraft. Limited coverage against low-altitude targets is concentrated in the western USSR and in high-priority areas elsewhere. Since 1983, the Soviets have begun to deploy two new types of air surveillance radars. These radars assist in the early warning of cruise missile and bomber attacks and enhance air defense electronic warfare capabilities.

The new large phased-array radar for ballistic missile early warning and target-tracking discovered in 1983 in Siberia is still under construction. This new radar closes the final gap in the combined HEN HOUSE and new large phased-array radar early warning and tracking network. Together, this radar and the five others like it form an arc of coverage from the Kola Peninsula in the northwest, around Siberia, to the Caucasus in the southwest. The new radar violates the 1972 ABM Treaty in that it is not located on the periphery of the Soviet Union, nor is it pointed outward as required by the Treaty. Its orientation and function indicate it is for ballistic missile detection and tracking--not space object tracking as claimed by the Soviets. The complete network of these radars, which could provide target-tracking data for ABM deployments beyond Moscow, probably will be operational by the late 1980s.

The Soviets may establish a network of satellites in geostationary orbit designed to provide timely indications of ballistic missiles, including submarine-launched ballistic missile (SLBM) launches. Such a network could be operational by the end of the decade.

The USSR has a strong research and development program to produce new early warning and other air surveillance radars as well as to improve existing systems. More than 15 types of these radars are currently in development. In addition, the Soviets are continuing to deploy improved air surveillance data systems that can rapidly pass data from outlying radars through the air surveillance network to ground-controlled intercept sites and SAM command posts. These systems will continue to be deployed until all areas are equipped with them.

Ballistic Missile Defense

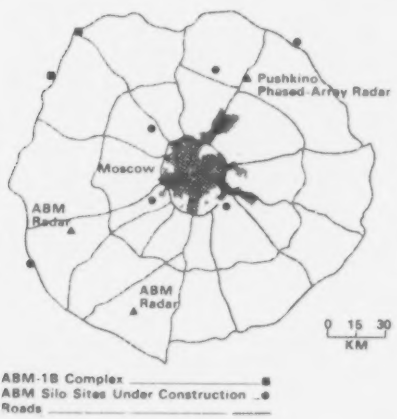
The Soviets are continuing a major upgrading of their ballistic missile defense capabilities. The Moscow missile defenses are being enlarged and equipped with a new generation of radars and interceptor missiles. Developments aimed at providing the foundation for widespread ABM deployments beyond Moscow are underway.

The new SA-X-12 surface-to-air missile, which incorporates ballistic missile defense capabilities, is nearing operational status, while research on directed-energy BMD technology continues apace.

The Soviets maintain around Moscow the world's only operational ABM system. This system is intended to afford a layer of defense for Soviet civil and military command authorities in the Moscow area during a nuclear war rather than blanket protection for the city itself. Since 1980, the Soviets have been upgrading and expanding this system around Moscow within the limits of the 1972 ABM Treaty.

The original single-layer Moscow ABM system included 64 reloadable above-ground launchers at four complexes for the GALOSH ABM-1B, six TRY ADD guidance and engagement radars at each complex, and the DOG HOUSE and CAT HOUSE target-tracking radars south of Moscow. The Soviets are upgrading this system to the 100 accountable launchers permitted under the ABM Treaty. When completed, the new system will be a two-layer defense composed of silo-based, long-range, modified GALOSH interceptors designed to engage targets outside the atmosphere; silo-based high-acceleration interceptors designed to engage targets within the atmosphere; associated engagement and guidance radars; and a new large radar at Pushkino designed to control ABM engagements. The silo-based launchers may be reloadable. The first new launchers are likely to be operational this year, and the new defenses could be fully operational by 1987.

Moscow Ballistic Missile Defense



The Soviets are developing a rapidly deployable ABM system to protect important target areas in the USSR. They have been testing all the types of ABM missiles and radars needed for widespread ABM defenses beyond the 100 launcher limit of the 1972 ABM Treaty. Within the next 10 years, the Soviets could deploy such a system at sites that could be built in months instead of years. A typical site would consist of engagement radars, guidance radars, above-ground launchers, and the high-acceleration interceptor. The new, large phased-array radars under construction in the USSR, along with the HEN HOUSE, DOG HOUSE, CAT HOUSE, and possibly the Pushkino radar, appear to be designed to provide support for such a widespread ABM defense system. The aggregate of the USSR's ABM and ABM-related activities suggests that the USSR may be preparing an ABM defense of its national territory.

In addition, the Soviets are deploying one surface-to-air missile system, the SA-10, and are flight testing another, the mobile SA-X-12. The SA-X-12 is both a tactical SAM and antitactical ballistic missile. It may have the capability to engage the LANCE and both the PERSHING I and PERSHING II ballistic missiles. The SA-10 and SA-X-12 may have the potential to intercept some types of US strategic ballistic missiles as well. These systems could, if properly supported, add significant point-target coverage to a widespread ABM deployment.

Air Defense

The Soviets have deployed numerous strategic and tactical air defense assets that have excellent capabilities against aircraft flying at medium and high altitudes. Although their capability to intercept low-flying penetrators is marginal, they are in the midst of a major overhaul geared toward fielding an integrated air defense system much more capable of low-altitude operations. This overhaul includes partial integration of strategic and tactical air defenses; the upgrading of early warning and surveillance capabilities; the deployment of more efficient data transmission systems; and the development and initial deployment of new aircraft, associated air-to-air missiles, surface-to-air missiles, and airborne warning and control system (AWACS) aircraft.

Over the years, the Soviets have invested enormous resources in their air defense systems. This sustained effort has produced an array of weapons systems designed for a variety of air defense applications. For example, they have fielded 13 different surface-to-air missile systems, each designed to cover a specific threat regime.

The Soviets have made significant shifts in the subordination of their air and air defense assets. The reorganization has resulted in a streamlined organization that merged strategic and tactical air and air defense assets in most land border areas of the USSR. The air defense (APVO) interceptors became part of a new structure, the Air Forces of the Military District (MD), which also includes most of the assets of the former tactical air armies. The Air Forces of an MD include all air assets in their geographic area (excluding Strategic Aviation and transport assets). These assets can be used either offensively or defensively as the situation requires. The new structure improves defensive capabilities, but its most significant impact is on the capability to conduct massed offensive air operations. Technological

advances in weapons systems and in command, control, and communications have made its implementation possible.

In terms of numbers alone, Soviet strategic and tactical air defense forces are impressive. Moreover, with the continuing deployment of new systems like the SA-10 SAM and impending deployment of the SA-X-12, these numbers are increasing along with capability. Currently, the Soviets have nearly 10,000 SAM launchers at over 1,200 sites for strategic defense, along with more than 4,000 launch vehicles for tactical SAMs, subordinated to nearly 445 launch units. More than 1,200 interceptors are dedicated to strategic defense, while an additional 2,800 Soviet Air Forces (SAF) interceptors could also be used. Further, the Soviets are continuing the MAINSTAY AWACS aircraft program and test and evaluation is underway. The MAINSTAY will substantially improve Soviet capabilities for early warning and air combat command and control, especially against low-flying aircraft. The MAINSTAY will also provide Soviet air defenses with overland and overwater capabilities to detect aircraft and cruise missile targets flying at low altitudes. Additionally, the MAINSTAY could be used to help direct fighter operations over European and Asian battlefields and to enhance air surveillance and defense of the USSR. MAINSTAY production could be about five aircraft per year.

The 1,200 all-weather interceptors assigned to strategic defense are primarily based in central air defense regions of the Soviet Union, in addition to fighter/interceptors subordinate to the military districts that are generally located on the periphery of the Soviet Union. The interceptor force is composed of a wide variety of aircraft with varying capabilities.

The deployment of the supersonic MiG-31/FOXHOUND interceptor, the first Soviet aircraft with a true look-down/shoot-down and multiple-target engagement capability, continued during 1984. The FOXHOUND, comparable in size to the US F-14 TOMCAT, is deployed at several locations from the Arkhangelsk area to the Far East Military District. More than 70 of these aircraft are operational.

The MiG-25/FOXBAT A/E is a high-altitude, high-speed interceptor that comprises approximately one-quarter of the strategic interceptor force. The upgrade program of the FOXBAT A to the newer FOXBAT E configuration provides a limited look-down radar capability. The remaining FOXBAT A aircraft are expected to be modified to the FOXBAT E configuration during 1985.

The MiG-23/FLOGGER B/G fighter comprises approximately one-third of the total strategic interceptor forces. This valuable geometry-wing fighter is equipped with a limited look-down radar. The remaining aircraft employed as interceptors (the older FLAGON, FIDDLER, and FIREBAR) comprise less than one-third of the force.

Two new fighter-interceptors, the Su-27/FLANKER and the MiG-29/FULCRUM, have true look-down/shoot-down capabilities. The FULCRUM is a single-seat, twin-engine fighter similar in size to the US F-16. First deployments of the FULCRUM to the Soviet Air Force military districts have begun, and more than 30 are now operational. The FLANKER is a larger, single-seat, twin-engine fighter similar in size to the US F-15. Both aircraft have been designed to be highly maneuverable in air-to-air combat.

The three latest Soviet fighter-interceptor aircraft are equipped with two new air-to-air missiles, the AA-9 designed for the FOXHOUND and the AA-10 designed for the FULCRUM and the FLANKER. The AA-9 is a long-range missile that can be used against low-flying targets; the AA-10 is a medium-range missile with similar capabilities.

The FLANKER and the FULCRUM, as well as the FOXHOUND, are likely to operate under certain circumstances with the new MAINSTAY AWACS aircraft.

Soviet strategic SAMs form barrier, area, and terminal defenses. They afford broad coverage for medium- and high-altitude defenses under all weather conditions. Five systems are operational--the SA-1, SA-2, SA-3, SA-5, and SA-10. Of these, only the SA-10 is capable of defending against targets with a small radar-cross-section such as cruise missiles.

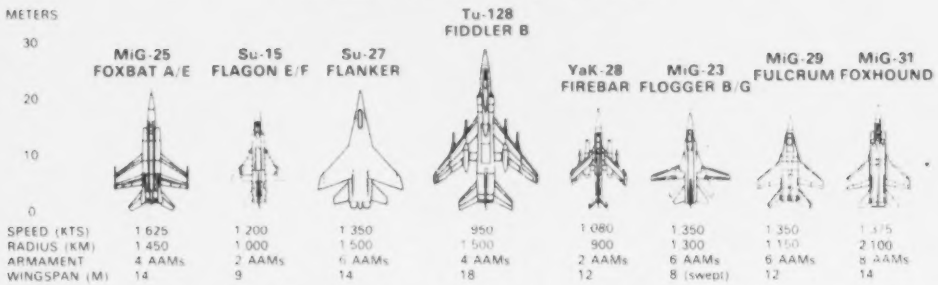
The first SA-10 site reached operational status in 1980. Nearly 60 sites are now operational and work is underway on at least another 30. More than half of these sites are located near Moscow. This emphasis on Moscow and the patterns noted for the other SA-10 sites suggest a first priority on terminal defense of wartime command and control, military, and key industrial complexes. Over the years, the Soviets have continued to deploy the long-range SA-5 and have modified the system repeatedly. Further deployment and upgrading of the SA-5 to enhance its capability to work in conjunction with low-altitude systems like the SA-10 are likely in the future.

In keeping with their drive toward mobility as a means of weapons survival, the Soviets are developing a mobile version of the SA-10 SAM. This mobile version could be used to support Soviet theater forces but, perhaps more importantly, if deployed with the territorial defense forces, it would allow the Soviets to change the location of SA-10 sites in the USSR. The mobile SA-10 could be operational sometime this year.

The 1980 air defense reorganization permits efficient integration of strategic and tactical SAM systems. Most tactical SAMs are not as range-capable as strategic SAMs, but many have better low-altitude capabilities.

A mixed and integrated system of aircraft, SAMs, and antiaircraft artillery (AAA) provides the Soviet Union with the most comprehensive air defense system in the world. Over 4,600 SAM launcher vehicles and 11,500 AAA pieces are deployed at regimental through front level. In addition, as many as 25,000 shoulder-fired SAM launchers are found at battalion and company level and with non-divisional units. The standard air defense for a tank or motorized rifle regiment is a battery of SA-9/13 SAMs and ZSU-23/4 self-propelled AAA pieces. The SA-9 system, mounted on a wheeled transporter-erector-launcher (TEL), is being replaced by the SA-13 on a tracked TEL. A follow-on to the ZSU-23/4 is expected shortly. The standard SAM at division level is the SA-6 or SA-8, although some divisions still have an AAA-equipped air defense regiment. A new division-level SAM, the SA-11, is beginning to enter the inventory. It features an onboard radar that increases mobility and target-handling capability. The standard weapon at army and front levels is the SA-4, soon to be replaced by the SA-X-12. The SA-X-12 has good low-altitude air defense capabilities as well as the ballistic missile defense

USSR Air Defense Interceptor Aircraft



	MiG-25 FOXBAT A/E	Su-15 FLAGON E/F	Su-27 FLANKER	Tu-128 FIDDLER B	YaK-28 FIREBAR	MiG-23 FLOGGER B/G	MiG-29 FULCRUM	MiG-31 FOXHOUND
SPEED (KTS)	1,625	1,200	1,350	950	1,080	1,350	1,350	1,475
RADIUS (KM)	1,450	1,000	1,500	1,500	900	1,300	1,150	2,100
ARMAMENT	4 AAMs	2 AAMs	6 AAMs	4 AAMs	2 AAMs	6 AAMs	6 AAMs	8 AAMs
WINGSPAN (M)	14	9	14	18	12	8 (swept)	12	14

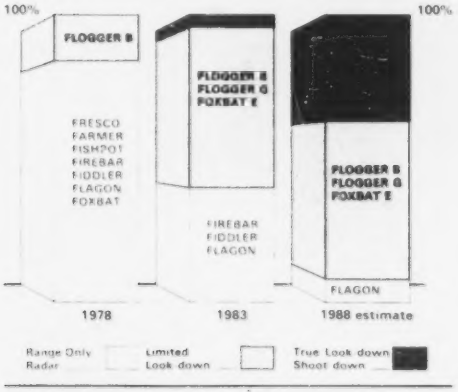
North American Air Defense Interceptor Aircraft

	F-106A DELTA DART	F-4C/D PHANTOM II	F-15A EAGLE	CF-18* HORNET
SPEED (KTS)	1,150	1,200	1,450	1,040
RADIUS (KM)	925	825	1,000	740
ARMAMENT	5 AAMs	8 AAMs	8 AAMs	6 AAMs
WINGSPAN (M)	12	12	13	12

*Canadian

Soviet Territorial Air Defense

Interceptor Aircraft Radar Capability



capabilities noted above. Soviet tactical SAM development is both broad-based and active. New tactical SAMs and improvements to older ones are now under development.

The largest concentration of SAM launchers and AAA pieces--over 8,100--is found opposite European NATO; over 4,200 are opposite the Sino-Soviet border and in the Far East; there are nearly 700 opposite southwest Asia and eastern Turkey; over 1,300 are in the Strategic Reserve military districts.

Passive Defense

Soviet passive defense preparations have been underway in earnest for some 30 years and have, over time, expanded from the protection of such vital entities as the national Party and government leadership and Armed Forces to embrace the territorial leadership, national economy, and general population. The Soviets regard passive defense as an essential ingredient of their overall military posture and war planning. In conjunction with active forces, the Soviets plan for a passive defense program to ensure the survival and wartime continuity of:

- Soviet leadership;
- military command and control entities;
- war-supporting industrial production and services;
- the essential workforce; and
- as much of the general population as possible.

As this program has expanded, elements of it have been designated by the Soviets as "civil defense." Use of this term in its normal Western context does not convey the full scope of Soviet Civil Defense.

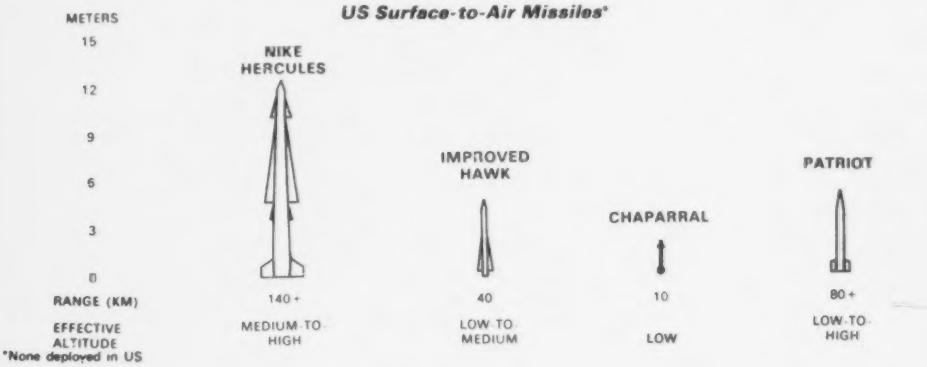
Extensive planning for the transition of the entire State and economy to a wartime posture has been fundamental to Soviet passive defense preparations. The Soviet General Staff and Civil Defense officials have supervised the development of special organizations and procedures to implement a rapid transition to war and have emphasized the mobilization and protection of all national resources essential to the successful prosecution of war and recovery.

The senior Soviet military establishment has also supervised the 30-year program to construct hardened command posts and survivable communications for key military commanders and civilian managers at all levels of the Party and government. Likewise, protective hardening, dispersal, and wartime production plans for Soviet industry have all been coordinated with the wartime requirements of the military and supervised by Civil Defense personnel. The protection of the general population through evacuation procedures and extensive sheltering in or near urban areas is the most visible aspect of the passive defense program.

The passive defense program reflects the Soviets' belief of their wartime need. The wartime management system would be the militarized system of national administration in which peacetime government bodies become Civil Defense components under direct military subordination. This would extend to Soviet territorial administration at all levels and to specialized functional components such as industrial, transport, power, communications ministries.

Soviet authorities at all levels would serve as uniformed chiefs of Civil Defense and command their respective organizations in a military capacity. Soviet Civil Defense thus serves both as a vehicle to administer peacetime preparations and training and as the infrastructure that would keep together civil and military bodies in the unified wartime management systems.

Soviet commanders and managers at all levels of the Party and government are provided hardened alternate command posts located well away from urban centers. This comprehensive and redundant system, composed of more than 1,500 hardened facilities with special communications, is patterned after similar capabilities afforded the Armed Forces. More than 175,000 key personnel throughout the system are believed to be equipped with such alternate facilities in addition to the many deep bunkers and blast shelters in Soviet cities.



Soviet passive defense efforts include measures to maintain essential production and services even during a nuclear war. Elaborate plans have been set for the full mobilization of the national economy in support of the war effort and the conversion to wartime production. Reserves of vital materials are maintained, many in hardened underground structures. Redundant industrial facilities have been built and are in active production. Industrial and other economic facilities have been equipped with blast shelters for the workforce, and detailed procedures have been developed for the relocation of selected plants and equipment. By ensuring the survival of essential workers, the Soviets intend to reconstitute vital production programs using those industrial components that can be redirected or salvaged after an attack.

The annual military and civilian cost of four elements of the program--pay and allowances for full-time Civil Defense personnel; operation of specialized military Civil Defense units; construction and maintenance of facilities for these units; and shelter construction--is less than 1 percent of the estimated Soviet defense budget. If duplicated in the United States, these four elements would cost roughly $3 billion annually. The cost of construction and equipment for leadership relocation sites over the past 25 years is between 8 and 16 billion rubles, or $28-56 billion if acquired in the United States.

North American Defense Forces

United States and Canadian interceptor forces assigned to the North American Aerospace Defense Command (NORAD) maintain continuous ground alert at sites around the periphery of the United States and Canada. Alert aircraft intercept and identify unknown intruders. At present, there are no SAMs for US continental air defense. In a crisis, the Air Force, Navy, and Marine Corps could provide additional interceptors. Supported by AWACS aircraft, these forces could provide a limited defense against bomber attacks.

To meet the increasing Soviet bomber and air-launched cruise missile (ALCM) threats, US interceptor squadrons assigned to NORAD are being equipped with newer more advanced F-15 and F-16 aircraft. These modern fighters will provide a look-down/shoot-down capability to detect and engage enemy bombers penetrating at low altitudes. The Canadians are upgrading their air defense forces with the CF-18. Joint United States and Canadian improvements to long-range surveillance include modern microwave radars for the Distant Early Warning line and over-the-horizon back-scatter radars looking east, west, and south.

Soviet space-oriented military systems pose a threat to the land, sea, and air forces of the United States. Some Soviet satellites are designed to support targeting of Soviet antiship cruise missiles launched against US surface ships. The US ASAT program, centering on the Air-Launched Miniature Vehicle, is part of the response to this and similar threats.

Finally, the United States has called for a research program to explore the possibility of strengthening deterrence by taking advantage of recent advances in technology that could, in the long term, provide an effective defense against ballistic missiles.

The Soviet Space Program

The Soviets believe in the combined arms concept of warfare in which all types of forces are integrated into military operations to achieve the desired goals. Space assets play a major role in this equation in the areas of antisatellite warfare; intelligence collection; command, control, and communications; meteorological support; navigational support; and targeting. The military support systems are linked to ground, naval, and air forces through earth terminals. Thus, Soviet forces can receive orders and information via satellite from command headquarters thousands of miles away. Their reliance on these systems is growing. Space weapons also play an important role in their strategic operations.

The late Marshal V. D. Sokolovskiy included space in a statement defining the modern concept of a theater of military operations. The Soviet drive to use space for military purposes is an integral part of Soviet military planning. The Soviet coorbital ASAT system, while launched from the ground, is a space weapon system. The Soviets also have two ground-based lasers that are capable of attacking satellites in various orbits. These systems suggest that the Soviets are willing to use space for military purposes that are more ominous than those for which it has been used thus far.

The Soviets are currently developing a version of the US space shuttle, a heavy-lift booster system, a space plane, and directed-energy weapons and have engaged in military-related experiments aboard the SALYUT-7 space station. The Soviets continue to pursue their manned space programs, maintaining in orbit the SALYUT space station, which is manned during most of the year. This gives the Soviets the capability to perform a variety of functions from space, including military R&D and using man to augment their other reconnaissance and surveillance efforts. In addition, there are other developments indicating Soviet research on space-based ballistic missile defense.

Antisatelite Systems. Since 1971, the Soviets have had the capability to attack satellites in near-earth orbit with a ground-based orbital interceptor. Using a radar sensor and a pellet-type warhead, the interceptor can attack a target in various orbits during the interceptor's first two revolutions. An intercept during the first orbit would minimize the time available for a target satellite to take evasive action. The interceptor can reach targets orbiting at more than 5,000 kilometers, but it probably is intended for high-priority satellites at lower altitudes. The antisatellite interceptor is launched from Tyuratam, where launch pads and storage space for interceptors and launch vehicles are available. Several interceptors could be launched each day. In addition to the orbital interceptor, the Soviets have two ground-based, high-energy lasers with antisatellite capabilities. The Soviets also have the technological capability to conduct electronic warfare against space systems and could use their ABM interceptors in a direct-ascent attack on low-orbiting satellites.

Space Boosters. The Soviets currently maintain eight space launch systems that are used to place objects in orbits ranging from low-earth to geosynchronous and beyond. They are developing two more systems--a TITAN-Class medium-lift launch vehicle and a SATURN V-Class heavy-lift vehicle.

Also, they are developing their version of the US shuttle orbiter, which seems almost identical to its US counterpart, except for the absence of main engines. It is estimated that the new heavy-lift vehicles will be used to launch their orbiter as well as other large payloads. This vehicle should be able to lift as much as 150,000 kilograms to low-earth orbit, giving the USSR a tremendous capability to orbit heavy objects, such as the components for a large, manned space complex. The estimate for the medium-lift vehicle is a payload capacity of approximately 15,000 kilograms. This system may be used to launch their space plane, discussed below.

Manned Space Program. The Soviets have emphasized man in space since the beginning of their space program. In 1961 they placed the first man into orbit. Their SALYUT space stations have accommodated cosmonauts for extended periods, setting several records in the process. In 1984, three cosmonauts set a new record, spending 237 days aboard SALYUT 7. In 1982, two Soviet cosmonauts spent 211 days aboard the space station. At the end of 1984, Soviet cosmonauts had accumulated 3,691 man-days in space compared to the US astronauts total of 1,289. In the spring of 1984, Soviet cosmonauts demonstrated their capability to perform on-orbit maintenance and repair by conducting extra-vehicular activity (EVA) five times, gaining valuable experience in on-orbit repairs. During one EVA, the cosmonauts added new solar panels to SALYUT 7. During another EVA, the Soviets accomplished another space first--a space walk by a female cosmonaut, Svetlana Savitskaya.

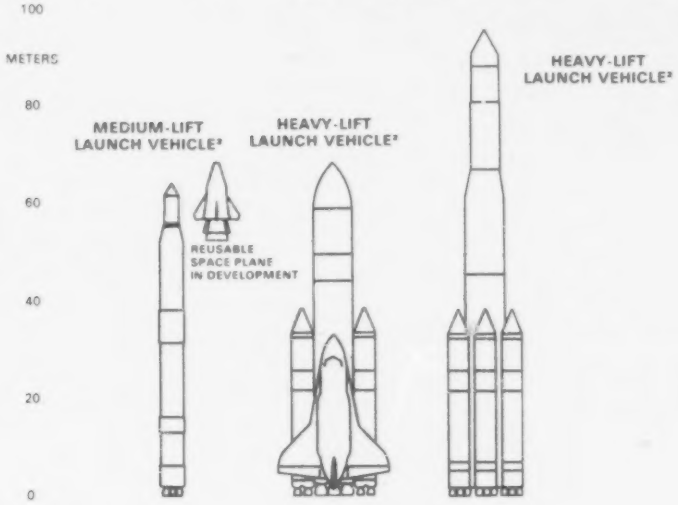
The Soviets have made known their plans to replace SALYUT 7 with large space complexes, supporting 20 or more cosmonauts on a permanent basis. Such a complex will enhance their space-based military support and warfighting capabilities. Missions could include military R&D, on-orbit repair of satellites, reconnaissance, imagery interpretations, ASAT support operations, and ballistic missile defense support operations. Their shuttle orbiter will likely be used to ferry cosmonauts to this station as well as to place satellites in orbit.

The Soviets apparently have already found some military utility in their manned space program. They have stated that "earth surface surveys" were conducted during past manned missions, but none of the photographs has ever been published. The combination of photographic and other missions aboard SALYUT 7 indicates the Soviets are aware of the potential value of manned space stations in an actual wartime situation.

The Soviets have been experimenting with a test vehicle that is apparently a scale model of a larger, manned space plane. This vehicle has been orbited unmanned on four occasions, landing in water each time. Similar in appearance to the earlier US Dyna Soar craft, this plane's possible missions include reconnaissance, crew transport, satellite repair and maintenance, and ASAT operations. It could also be used as a manned space station defender. A clue to its purpose is found in a 1965 Soviet definition of antispace defense: "A component part of air defense. The main purpose of antispace defense is to destroy space systems used by the enemy for military purposes, in their orbits. The principal means of antispace defense are special spacecraft and vehicles (e.g., satellite interceptors), which may be controlled either from the ground or by special crews."

Soviet Space Launch Vehicles

	SL-3	SL-4	SL-6	SL-8	SL-11	SL-12	SL-13	SL-14
LIFT-OFF WEIGHT (KG)[1]	290,000	310,000	310,000	120,000	180,000	680,000	670,000	190,000
LIFT-OFF THRUST (KG)[1]	410,000	420,000	420,000	160,000	280,000	900,000	900,000	280,000
PAYLOAD TO 180 KM (KG)[1]	6,300	7,500	2,100	1,700	4,000	—	19,500	5,500



	MEDIUM-LIFT LAUNCH VEHICLE[2]	HEAVY-LIFT LAUNCH VEHICLE[2]	HEAVY-LIFT LAUNCH VEHICLE[2] WITH 6 OR MORE STRAP ON BOOSTERS
LIFT-OFF WEIGHT (KG)[1]	400,000	2,000,000	4,000,000
LIFT-OFF THRUST (KG)[1]	600,000	3,000,000	4,000,000
PAYLOAD TO 180 KM (KG)[1]	15,000 +	30,000	150,000

[1] Approximate
[2] In final stages of development

The Soviets have openly discussed their plans for ambitious planetary exploration in spite of their apparent decision not to match US lunar expeditions. In 1992, the condition for a launch to Mars will be favorable, and the Soviets are considering a manned expedition to that planet at that time. They have stated that the recent manning of the SALYUT space station for increasingly longer periods of time is to simulate the time it would take to conduct a Mars mission. This timeframe also coincides with the 75th anniversary of the Bolshevik Revolution and with the 500th anniversary of Columbus' discovery of the New World. Such an expedition would add great prestige to the Soviet Union and would further demonstrate the capability of its space technology.

Military Space Systems. Soviet space systems dedicated to military missions include satellites that perform reconnaissance, missile-launch detection and attack warning, command and control, and ASAT operations. Dual-purpose satellites that perform some civilian functions are used for communications, navigational support, and weather prediction and monitoring. The US has no counterpart to Soviet ocean reconnaissance satellites, the Electronic Intelligence Ocean Reconnaissance Satellite (EORSAT), or the nuclear-powered Radar Ocean Reconnaissance Satellite (RORSAT). Their mission is to detect, locate, and target US and Allied naval forces for destruction by antiship weapons launched from Soviet platforms. These systems track naval and merchant shipping. Four such satellites were launched in 1984, two of which were of the same type (RORSAT) that crashed in 1978, one spreading radioactive debris across northern Canada.

The Soviets have recently employed a new radar-carrying satellite system. Designed for mapping ice formations in polar regions, these satellites will greatly enhance the ability of the Soviet Navy to operate in icebound areas. The system can be used to aid in the navigation of northern sea routes to assist in moving naval ships from construction yards in the western USSR to new ports in the Pacific.

The launch rate of satellites to geostationary orbits has risen in recent years. In the period 1974-78, one to two launches per year were conducted. In 1979, the rate increased to five per year, and eight launches occurred in 1984. These satellites are presumed to be for communications, although not all may have been for that purpose. The Soviets have filed their intent with international organizations to place almost 40 satellites in 21 different positions in the geostationary belt. Many of these satellites are years overdue, but the Soviets are apparently determined to fill the announced slots. The Soviets are also in the early stages of developing a satellite system called GLONASS, which, when fully developed, should provide the Soviets with accurate positioning data worldwide.

For the most part, Soviet satellites do not have lifetimes as long as those of their US counterparts. This is especially true of their reconnaissance platforms, necessitating frequent launches of replacements. However, the Soviets have shown great flexibility in maintaining these systems in orbit, augmenting them with extra satellites as warranted by changing situations. They have demonstrated a launch surge capability that could be a distinct advantage in time of hostilities. In 1984, the Soviets orbited a

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reconnaissance satellite that stayed in orbit far longer than previous ones. This could indicate a new system or an advanced modification of an old one, demonstrating their increasing sophistication and capabilities.

In late 1984, a new Soviet auxiliary ship was seen arrayed with extensive radomes and antennae. The ship, named after the first commander of the Strategic Rocket Forces, Marshal M.I. Nedelin, appears to be a new space and missile support ship capable of a variety of missions, including support to strategic forces worldwide. On its maiden voyage the NEDELIN transited directly from the Baltic to the port of Vladivostok, the headquarters of the Pacific Ocean Fleet. This ship will significantly upgrade the Soviet capability to test new generations of missiles as well as support the expanding Soviet space program. The NEDELIN joins a growing fleet of Soviet space support ships that provide assistance to manned and unmanned missions. An additional ship of the NEDELIN-Class is under construction.

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C.2 THE MANAGERIAL AND BUDGETARY RELATIONSHIP AMONG THE VARIOUS AMERICAN STRATEGIC DEFENSE ACTIVITIES

C.2.1 CONGRESSIONAL REPORTING REQUIREMENTS

The following is submitted in response to the Congressional request on "...the managerial and budgetary relationship among the various American strategic defense activities, including the impact of the Strategic Defense Initiative on the Air Defense Master Plan, and the impact of the Strategic Defense Architecture Study on present and prospective strategic anti-submarine warfare programs."

C.2.2 FOCUS OF THE STRATEGIC DEFENSE INITIATIVE

The Strategic Defense Initiative is focusing on defenses against ballistic missiles because the speed, short warning time, and great destructive capability of ballistic missiles pose a greater threat to stability than do slower-flying systems such as bombers and cruise missiles.

The technologies that are becoming available today may offer the possibility of providing a layered defense utilizing capabilities which can attack ballistic missiles in all stages of their missile trajectory. This concept of a layered defense could be extremely effective by providing several opportunities to destroy attacking missile warheads before they reach the territory of the United States and that of its Allies.

C.2.3 DETERRENCE AND STABILITY

Defenses against ballistic missiles can have a highly beneficial effect on deterrence and stability in three quite specific ways. First, by demonstrating the ability to destroy the bulk of an attacker's ballistic missile warheads, an effective defense can undermine a potential aggressor's confidence in his ability to predict the likely outcome of an attack on an opponent's military forces. No aggressor is likely to contemplate initiating a nuclear conflict, even in crisis circumstances, while lacking any confidence in his ability to obtain a successful outcome.

Second, with the ability to effectively destroy attacking ballistic missiles, and thus rendering them "impotent and obsolete" for military or political purposes, such defenses also can eliminate the potential threat of first-strike attacks.

Third, by reducing or eliminating the utility of Soviet shorter-range ballistic missiles which threaten Europe, defenses can have a significant and specified impact on deterring Soviet aggression in Europe. Soviet SS-20s and shorter-range ballistic missiles provide overlapping capabilities to target all of NATO Europe. This capability is combined with a Soviet doctrine that stresses the use of conventionally-armed ballistic missiles to initiate rapid and wide-ranging attacks on crucial NATO military assets throughout Europe. The purposes of this tactic would be to reduce significantly NATO's ability to resist the initial thrust of a Soviet conventional force attack and to impede its ability to resupply and reinforce combatants from outside Europe. By reducing or eliminating the military effectiveness of such ballistic

missiles, defensive systems have the potential for enhancing deterrence not only against strategic nuclear war, but against nuclear and conventional attacks against Europe as well.

Finally, in conjunction with air defenses, effective defenses against ballistic missiles could help reduce or eliminate the apparent military value of nuclear attack to an aggressor. By preventing an aggressor from destroying a significant portion of our country, an aggressor would have gained nothing by attacking in the first place. In this way, effective defenses could reduce significantly the possibility of nuclear conflict.

Because an effective defense against Soviet ballistic missiles is the more difficult technology to achieve (according to expert scientists and engineers), and because ballistic missiles are potentially more destabilizing, priority is being given to the examination of those technologies that might prove effective against this threat. In view of the current Soviet nuclear force structure which emphasizes ballistic missiles, not air breathing forces, the deployment of a robust air defense system would occur only in conjunction with the deployment of an effective defense against ballistic missiles.

C.2.4 AIR DEFENSE MASTER PLAN

The purpose of Air Defense Modernization is to address existing critical deficiencies in the U.S. ability to detect and defend against bomber and/or cruise missile attacks. The planned objective and on-going thrust of Department of Defense North American Air Defense (NAAD) modernization efforts is to: field modern radar and related C^3 systems to provide contiguous coverage around North America; improve fighter interceptor capabilities; and improve operational planning to utilize new resources effectively to ensure significantly improved detection, attack assessments and engagement capability.

Together with Canada, the U.S. is modernizing the obsolete radars that provide surveillance of the northern approaches to North America. The new radars, known as the North Warning System, will fill gaps in existing coverage, enable the U.S. to detect low-flying aircraft, and be cheaper to maintain than the present system.

C.2.5 STRATEGIC AIR DEFENSE

Because it is still in the research phase, the Strategic Defense Initiative has a minimal relationship with the near-term air defense improvement effort. As we look to the year 2000 and beyond, however, SDI is expected to have a much greater impact. Study efforts will not ignore the relationship between the research of the Strategic Defense Initiative and strategic air defense. Strategic air defense requirements are currently under review and continuing progress in the area of the Strategic Defense Initiative will permit the addressing of even more comprehensively the interrelationship between SDI and strategic air defense.

C.2.6 ANTI-SUBMARINE WARFARE (ASW)

One of the principal missions in war is protection of the sea-lines of communication which tie the U.S. to its Allies, U.S. forces, and many of the resources essential to the U.S. economy and to its ability to continue to defend the U.S. and its Allies.

Countering the Soviet submarine threat requires a layered strategy that both maximizes enemy attrition and affords a high level of protection for U.S. naval forces. The best means of neutralizing enemy submarines is to engage them in forward areas and at barriers--before they come within range of attacking our forces. For this, the U.S. relies primarily on attack submarines and long-range P-3 patrol aircraft supported by undersea surveillance systems. Enemy submarines that escape forward sweeps and penetrate the U.S. ASW barriers must contend with a layered defensive screen surrounding its naval task forces and convoys. Within this layered defense system, long-range protection is provided by land- and carrier-based patrol aircraft and by attack submarines operating in a direct-support role. At shorter ranges, protection is provided by formations of surface combatants equipped with passive and active sonar systems and by torpedo-armed antisubmarine helicopters.

Nuclear-powered attack submarines (SSNs) remain a key element of the U.S. ASW defense-in-depth strategy and are an integral part of our forward offensive strategy, especially for anti-submarine operations.

The need to counter the Soviet submarine threat will continue to remain a high priority for the indefinite future. This requirement is generally independent of air defense modernization efforts. Recent developments do, however, provide one area of common concern. The impending Soviet deployments of new, long-range nuclear sea-launched cruise missiles (SLCM) provide added importance to our efforts in this key mission area. The magnitude of existing threats from Soviet ballistic missiles, however, far exceeds the threat from near- or mid-term SLCM deployments. The U.S. is exploring measures which could become meaningful should it develop an effective defense against ballistic missiles, including additional warning and defensive measures.

C.3 THE RELATIONSHIP OF OTHER PROGRAMS WITH SDI

C.3.1 CONGRESSIONAL REPORTING REQUIREMENTS

The following deals with the Congressional requirement for a report on "...the relationship of other missile and space defense programs, and other directed energy programs, that have not been included in the SDI, with the SDI program."

C.3.2 PROGRAMS NOT INCLUDED IN SDI

Tables C.1 and C.2 are from the Congressional Budget Office Report to the Senate Foreign Relations Committee, Subcommittee on Arms Control, Oceans, International Operations and Environment, May 23, 1984.

TABLE C.1

EXAMPLES OF PROGRAMS NOT INCLUDED IN SDI BY THE BROADER DEFINITION
(IN MILLIONS OF DOLLARS OF BUDGET AUTHORITY)

PROGRAM ELEMENT	NAME	1984	1985	1986
64406F	Anti-Satellite (ASAT) R&D[1]	202.7	133.0	149.9
63226E	Air Defense Surveillance Warning (Teal Ruby)	32.2	31.0	25.0
63401F	Research on Satellite Power and Survivability (Advanced Spacecraft Technology)	0	6.9	9.7

ASAT research and development funds could be regarded as part of a comprehensive defensive program to negate surveillance satellites. ASAT technology could be used in the development of a ballistic missile defensive system.

C.3.3 ASSOCIATED RESEARCH NOT INCLUDED IN SDI FUNDING

TABLE C.2

EXAMPLES OF ASSOCIATED RESEARCH NOT INCLUDED IN SDI FUNDING
(IN MILLIONS OF DOLLARS OF BUDGET AUTHORITY)

PROGRAM ELEMENT	NAME	1984	1985	1986
63605F	Advanced Radiation Technology	46.7	5.0	19.7
62707E	Particle Beam Technology	30.9	17.4	21.5
62307A	Laser Weapons Technology	20.0	21.1	21.4
63424F	Missile Surveillance Technology	0	3.0	11.6
65806A	DoD High Energy Laser Facility	37.1	32.8	20.2

Most of the activities in directed energy weapons have tactical applications such as surface-based particle beam research, that was left out of SDI since it is unlikely that a strategic defensive system will utilize surface-based particle beam weapons.

Other activities, such as Missile Surveillance Technology supports the Advanced Warning System which could be part of a strategic defensive system. Some of the Army BMD monies outside SDI in FY 1986 seem to be related to SDI technology development, but need to be checked out in Descriptive Summaries.

C.4 LONG-TERM COSTS OF STRATEGIC DEFENSES

C.4.1 CONGRESSIONAL REPORTING REQUIREMENT

This section addresses the Congressional requirement for a report on "...the projected long-term costs of strategic defenses, including research, testing, procurement and operations and maintenance costs on a year-by-year basis of the various systems and technologies currently in service and under study."

C.4.2 LONG-TERM COSTS OF STRATEGIC DEFENSES

The SDI is a broadly based research program that is designed to determine whether newly emerging technologies could support an effective defense against ballistic missiles in the future. At this time, the actual capabilities of these technologies are not sufficiently defined to provide a sufficient basis on which to fashion a likely defense system configuration. Until SDIO has a more complete picture of what an effective defense system might look like--as well as the technologies that would form the constituent parts of such a system--it will not be possible to determine the full range of long-term costs that might be associated with a potential future strategic defense. One of the results of the SDI program will be the data necessary for an assessment of the long-term costs of a defensive system.

At this point, what can be provided is the cost of the research program itself, that is estimated to be approximately $26 billion over the next five years, which includes $1.4 billion (appropriated) in FY 1985; $3.7 billion (requested) in FY 1986; and $4.9 billion (estimated) in FY 1987. Additional costs that would stem from a decision to enter into full-scale engineering and deployment of a defensive system, as well as operations and maintenance of such a system, would depend on the particular technologies selected, the capabilities of those technologies, the systems in which those technologies would be deployed, and the strategic environment at the time of deployment. Because this information will not be available until more is known about the potential of the technologies involved and the course of future arms control negotiations, long-term defense cost estimates are not feasible at this time.

Cost estimates for currently available defensive systems or components, like the retired Safeguard ABM system or various ABM test radars are available, but because these systems bear little resemblance to a potential advanced defense system, such estimates cannot provide a useful basis for estimates of future advanced defense system costs. Moreover, were the U.S. to build a defense system today based on Safeguard and similar technologies, the hardware, production techniques and costs would likely be substantially different from those used over a decade ago.

The Department of Defense realizes fully the importance of this question and appreciates that it is central to any future national decision whether to develop and deploy defensive systems. As cost estimates are generated in the future, they will be made available to the Congress in a timely manner.

Senator EXON. The report will be very helpful. Then if we could have a cover letter from you that highlights the key points, that would also be very helpful to us, General.

General ABRAHAMSON. I will be happy to do that.

[The letter referred to follows:]

THE SECRETARY OF DEFENSE,
Washington, DC, March 28, 1985.

Hon. BARRY GOLDWATER,
Chairman, Committee on Armed Services,
U.S. Senate, Washington, DC.

DEAR MR. CHAIRMAN: The FY 1985 Authorization Conference Report (98-1080) established the requirement for annual submission of a report "on the programs that constitute the Strategic Defense Initiative (SDI) and other programs, if any, relating to defense against strategic ballistic missiles." The report is to be transmitted to the Committee on Armed Services and the Committee on Foreign Affairs of the House of Representatives and the Committee on Armed Services and the Committee on Foreign Relations of the Senate. The FY 1985 Appropriations Conference Report (98-1159) directs that this report be provided to the Committees on Appropriations of the House and Senate as well. Additionally, the House Appropriations Report (98-1086) calls for a report similar to that required above. The attached report is intended to address these requirements.

The report is a comprehensive document touching on nearly every aspect of the Strategic Defense Initiative. The SDI remains central to the President's vision of freeing the world from the fear of nuclear conflict with an ultimate goal of eliminating nuclear weapons. This document, then, shows the SDI as moving toward this objective with a program of vigorous research focused on advanced defensive technologies seeking to find ways to provide a better basis for deterring aggression, strengthening stability, and increasing the security of the United States and our Allies. All of the research conducted under this program is and will be in compliance with U.S. Treaty obligations.

Of particular note are the portions addressing program, project, and task detail. To some, our request for $3722 million in FY 1986 may appear to be an overly ambitious expansion from FY 1985 levels. This assuredly is not the case as these sections clearly show. The SDI is a multi-faceted research program, not a business-as-usual weapons development effort. As a research program, resources are allocated and used more quickly. In fact, in FY 1985 the SDI had obligated nearly 40% of its budgeted resources by the end of the first quarter. This is unprecedented in an effort of such magnitude and indicates that the program is on track, resolutely pursuing the objectives that have been set forth, and can be executed at the pace that has been programmed.

As I have said previously, I believe the Congress will want to pursue courses that have the potential of enhancing deterrence and stability and will support our efforts to keep the program moving on a prudent schedule.

Sincerely,

WILLIAM H. TAFT IV,
Deputy Secretary of Defense.

Senator EXON. Hopefully, the report from you might be unclassified. There is a public awareness on this that we have to answer. We can't say, "That is classified and I can't tell you about it."

General ABRAHAMSON. The compliance report itself is classified. However, many of the major categories that we are talking about here are unclassified and we can give you an unclassified summary that I hope will sufficiently allow you to answer those questions.

Senator WARNER. I would hope that can be done fairly expeditiously.

General ABRAHAMSON. Yes, sir.

Again, I have gone over both of the multiple layer systems. Our concern is that we be able to attack in the boost phase which is a very major element and very important element of this system as well as the advantages of a multiple layer.

Here one can begin to see the advantages and the problems that this presents to a Soviet war planner.

Now, this is nothing but a confidence calculation. What it does is that it poses as potentially possible the setting up of three layers of defense where each layer would allow 20 percent to get through.

So, if you had only one layer, and your objective was to ensure that the other side could, or if you were a Soviet planner and your objective was to get one through that three layers of defense, or even two warheads or three warheads through, then this illustrates the leverage of a layered defense.

This is why we keep emphasizing a layered defense. If you only had a single layer and they wished to penetrate that layered defense and you had 20 percent leakage in that particular layer—and, by the way, these are confidence calculations, and let me just illustrate the confidence calculation.

If you had two dice and you wanted to roll a seven, I believe it is one in six chances to roll a seven on a single roll. That means that you have a kind of 18 percent probability for that one roll you can get a seven.

But that is not good enough for a military planner. Our own target planners and the Soviets want to have a confidence level that they can get through and destroy a target and they do use statistical calculations to develop that confidence.

At this point in time, of course, the Russians have to only consider really three things.

No. 1, their own missile's reliability and they know that because they test it very often, their own missile's accuracy and they know that because they test it very often.

The only thing then that affects their probability or confidence that they can destroy U.S. targets is the hardness of that target.

That intelligence is simple for them to get in this country so they can make that calculation reasonably accurately as well.

So, for soft targets they target [deleted], as well as we can understand, for each of the Soviet targets such as a military airfield if it is of a reasonable size.

For hard targets such as Minuteman silos or command and control facilities in the United States or in Europe they would target [deleted]. If they were really concerned about it, they might target [deleted].

That is because there is absolutely no defense.

If, in contrast to that, they wanted to have, let us say, a 50 percent—that is what the left-hand side of each of these numbers is—50-percent confidence, they could destroy or get one of their penetrators through, that is not destroy, but just to get the penetrator through, and now they are faced with the problems of how many rolls do I have to make with that dice in order to have a 50-percent chance that I will ensure I get a seven.

Let me change its roll probability, but there is a certain number and you have high confidence you will get a 7, or a 90-percent confidence you will get that 7. By the way, that is about 6 or 7 rolls for 50 percent.

So, this is a statistical calculation. If you have only a single layer and they want to get through that single layer, if they add more

warheads—it is not many, just a few more—they can get through any one which they hope will get to a single target.

If you have two layers now, he has a much more complex problem because he cannot predict which of his ones will get through the first layer and, therefore, he can't add a very large stream of warheads right around that first one to ensure which ones get through the second layer.

So, now it begins to be up in the tens and dozens of warheads that allow him to ensure himself that he gets even one through at 90 percent, that number of warheads, if you have three layers operating, you are clearly up in the hundreds of warheads in order to get one through.

Now, there are some fundamental assumptions behind this and one is that these layers are inexhaustible in terms you can't overcome it.

My key point is for all those people who make the argument that it is a very simple task and one that it doesn't cost them very much to be able to just build a few more warheads and to overcome your system, if you can have several layers of defense and each layer is reasonably effective, it doesn't have to be perfect by any means, you force them into a terribly uncertain attack plan.

That is the real message we wanted to bring. The uncertainty goes up, not number of warheads they must add in order to gain certainty, but it could be hundreds of warheads.

So, it becomes then a very difficult choice for them about do I add more warheads because I might have to add so many?

So, we try to emphasize that.

Now, how is this program laid out and what is the relationship of one of those partial kinds of systems and the President's final goal?

As we see this, the technology can be divided into what we call mature technology, some advanced systems which are quite countermeasure resistant and hopefully will be very, very cost effective, and finally there are some technologies that we are just beginning to understand the potential, and these we call innovative technologies that we believe can achieve the defense that the President would like.

Now, this is a practical phased way that one would proceed if there were development and deployment decision. Now, that decision has not been made yet. We are in the R&D phase of the program.

In our R&D budget we have money that is bringing these mature technologies forward and I will show you some examples of those. It is those mature technologies that if there were a decision, either early or late, they would probably be the first ones that we would begin to develop an initial capability.

This is capability coming up here and effectiveness coming up here and time here. I don't know when that decision will be made. We believe it could be made with a broad area of confidence in the early nineties.

On the other hand, if the national requirement were to come later, there are some technologies we could use. If it were to come later, we would have these further along and your initial system would have increased effectiveness. But it is very important for the Soviets to get a message and that message is that in every year's

budget we have all three of those technologies and the reason is because if we only said that we are going to exploit our first mature technology, they can see exactly what we are doing.

They understand the implications of those technologies and they say fine, you are going to go up to some partial capability and this is only a notional one. You are going to start with some capability.

They are going to develop countermeasures. If they saw your budget only had those mature technologies in it, then they would say, I believe it is attractive to begin to build more missiles to try to overcome the system.

But if they see your budget has in it and you are making progress in the advanced technologies as well, then they know you are not going to stop here. You are going to keep going further and it is therefore a bad investment for them to invest in missiles because they have already demonstrated their concern about our system. They know we can do this job in spite of a number of people who feel other than that, and they know that if we are making the investment and we are making progress in all three of those areas, then at some point we are going to start up that curve and we are going to keep going on that curve.

That is why it is so important now, as a message for the Soviets, to have in this year's budget in 1986 an amount of money that deals not only with mature technology in the beginning, because surely those are exploitable, it is something that one could begin to do in the nearer term, but also that we have money so that we are making progress in the advanced technology and some money for the long-range technologies.

Now, let me give you some example of what these are.

We are trying to modify the Soviet behavior here. It is a difficult problem. Obviously, this is a plea for money that allows me to have each of those categories. Let me talk about what they are briefly.

[Slide deleted.]

MATURE TECHNOLOGY

Please remember it is not enough to have weapons. We must also have the sensors and battle management and C^3 system or you can't do anything with them.

So, I have divided them for the United States and our allies and I have talked about boost phase and post-boost phase as early layers that we think are technically important.

Midcourse is also important and terminal is not point defense, but it is area. It could be the entire area over the United States for some of these kinds of systems.

Now, the first class of systems, the ones that are attractive in terms of they could be exploited with mature technologies early, are not the advanced directed energy systems that are so often the point of conjecture and a lot of argument on the program. They are the mature technologies that we know how to build and for which we have a good solid technical base.

We are prepared, and I don't know if either of you have seen the HOE shot itself, to discuss some of the applications of that experiment.

Have you had the opportunity? It is dramatic.

I would like to underscore what I think that means. This is an example of the demonstration which is done within the treaty, but that says this is technology which can be used broadly, but we have demonstrated feasibility here.

The way we did this was within the terms of the ABM treaty, that is a ballistic missile firing out of Vandenberg Air Force Base. That is the ballistic missile heading out 4,500 miles.

At Kwajalein we had set up, using just a basic radar system that was there, an interceptor. [Deleted.]

We couldn't do that within the treaty. Nevertheless, we had components built up and represented the kind of system one would use if you really were going to deploy.

When the radar told us we have the missile in sight, we launched. What we were demonstrating was the guidance system associated with the intercept. We have this animation section which shows us what happened.

Senator WARNER. You have two missiles.

General ABRAHAMSON. This is the interceptor missile. That is the staging associated with that. [Deleted.]

After burnout, [deleted] it began to maneuver this thing in such a way that it looked out and saw the ballistic missile coming through, warheads coming in, it could see it, directed itself to that path and then it opened up the [deleted] net which has a lot of steel balls on it.

The point is this thing was coming so fast, [deleted].

This is a ground telescope. This is operated by a man. That is burn out of one of the stages. Now you begin to see it jump around. That is because the man is tracking tremendous heat. As it begins to do maneuvering in space, he is having difficulty following this.

You will also see a star go across that. It is not in the test. It upset the man so much that he jiggled a little.

Now, the vehicle is maneuvering to get to a point where it can intercept. There is the star again.

There was a little 1-pound charge of plasticizer.

Senator WARNER. When did this take place?

General ABRAHAMSON. On June 10.

Now, this is an aircraft operated video that picked up. [Deleted.] This is the pieces of the warhead reentering the atmosphere and burning up.

Senator WARNER. Is that boost or midcourse?

General ABRAHAMSON. What we demonstrated is that you can hit one of these things in space at that tremendous speed. We didn't demonstrate that you can just go from the terminal area.

It depends on how you want to do it. If you shot it from an installation in North Dakota, you are talking about terminal area, the HEDI vehicle that we are now looking at as the next phase in this particular development program shrinks it way down to a small inexpensive piece of equipment [deleted].

This shrinks it down to something that will cost less than a [deleted]. That is the next stage in the technology, bring that cost down.

If you put it in North Dakota, depending on what size rocket you put under it, it could in fact reach out [deleted].

So, this is clearly a terminal area type of system and the HEDI which is in our program is the next logical step building on that particular experiment.

Senator WARNER. This one would have been midcourse?

General ABRAHAMSON. [Deleted.]

Senator WARNER. What was it actually?

General ABRAHAMSON. Actually because of the way the treaty and all those things are, it was about [deleted].

However, we could have put that in a [deleted].

Senator WARNER. Essentially you are telling us you can build an instrument that can take off from some platform [deleted] and it will intercept this thing with proven accuracy at various stages?

General ABRAHAMSON. We have demonstrated feasibility. [Deleted.]

You could even base it in space. [Deleted.]

We have demonstrated it is a technology that applies to all those stages in one shot. People don't recognize that, unfortunately.

So, all of these now are beginning to proceed, but that is not enough. You have to have the sensors that trigger it and guide it, at least initially, and you have to have a battle management system to do this. These are space-based sensor systems that I will comment on further on and this is a [deleted].

That, unfortunately, is why it takes so much money because we have to carry multiple methods and one goes ahead. So, these are all fairly mature technologies, including these sensors.

[Slide deleted.]

General ABRAHAMSON. Now, some of the advanced systems, the things that we have not demonstrated, but we are making great progress on.

In boost phase it would be possible with a mirror to use a ground-based laser [deleted]. Please note I believe that has a potential for early application.

[Deleted.]

I want to let you understand that we are trying to be able to move ahead rapidly where we see some of the clear potential.

The space-based laser [deleted]. While we are doing a considerable amount of work here, it is coming along a little later.

Now, there are some differences of opinion among the people in the Congress and others about the maturity of that and how it could be used.

The hyper velocity gun can be used in boost phase, but it also can be used in several other applications here, even in terminal application firing in the atmosphere if you improve the projectile. I will show you some of our progress here.

So, on the weapons side we have those. We also can add in space a neutral particle beam and eventually even an x-ray laser to make this work.

Remember, this is driven by a nuclear [deleted]. In every case, however, these weapons, because they have to be pointed so accurately, require advanced imaging, a lot of work in sensors and our directed energy systems require work in discrimination, telling the difference between decoys and real ones that we want to fire at.

Senator WARNER. The word neutral in this association means what?

General ABRAHAMSON. Neutral means it doesn't have a charge, it is not positive or negative.

Now, these are some of the advanced technologies. Some of them are coming earlier, some could come later. They are behind the rather mature systems that are really based on the rocket burst and sensor work and guidance work we have done for a long time.

[Slide deleted.]

I won't brief all of these, it is a terrible chart. I just want to point out a couple of ideas.

INNOVATIVE TECHNOLOGY PROGRAM

We are proceeding with an innovative technology program. That is the one that gets you all the way up to the very high level of effectiveness that the President talked about. I don't know which of these are going to pay off, but some of these are very, very exotic kinds of things. We have set in 1985 $100 million for work with universities, small businesses on innovative programs.

In fact, we have in 1985 already released funds to the first of these several universities and it is a consortium of universities working on space power and [deleted].

These are a long way away. Some of them are not going to work. The point is that we are investing and some of our best minds are very enthusiastic in trying to see some of these advanced technologies get ahead.

Some of the ideas are really exciting. They are not all a long way away, but a lot of them are not going to be mature for quite a period of time.

[Slide deleted.]

I have tried to divide this into two technologies.

Here we are $1.4 billion. Here is our 1986 number. We have divided it between these program element numbers, surveillance and acquisition, directed energy, kinetic energy, system analysis and battle management, lethality, and, of course, there are some management kinds of activities as well.

In every case, and I testified about this in the open session, I believe the long pole in the tent in getting to deployment is in battle management and in surveillance as one goes ahead.

So, I have increased the amount of money here and we are maintaining this was already properly funded. So, I have increased this and that. You can see in fact there is a much smaller amount going into the various weapons, but a lot of basic technology in all of those——

SURVEILLANCE, ACQUISITION AND TRACKING

Senator WARNER. I am told that in the House of Representatives there is some disposition to slow down the area of surveillance, acquisition and tracking.

General ABRAHAMSON. That is what they did last year and I believe it is the biggest mistake that one can make.

Senator WARNER. Assuming as I do that they are truly conscientious persons, what is the data base on which they are making the decision to slow it down?

General ABRAHAMSON. I am not sure I understand all of that, sir. I think last year there was a great deal of confusion on the program as a whole. It may be out of some of that confusion that some of that cut last year started.

As we talk to House members this year, we are trying to underscore our need to proceed here. In fact, in this line there are several classified projects that are very high priority.

I will show you some classified examples and brief you on some of the results of that. I think those were not well understood by them.

Senator WARNER. Will you put that slide back up for a moment?

General ABRAHAMSON. Sure.

Senator WARNER. General, I am going to ask you an unfair question, but these things go through our minds.

You have pretty well indicated to me that you got $3.7 billion.

General ABRAHAMSON. 3.7 billion.

Senator WARNER. Are those dollars?

General ABRAHAMSON. Yes, sir.

Senator WARNER. You say that you think it is a terrible mistake when the House cut down on that first program element; is that right?

There are six programs all interrelated? Is that a fair way to state that?

General ABRAHAMSON. I will show you how some of those interrelationships work.

Senator WARNER. Are you saying at the start that they all interrelate to the point that nothing could be taken off any of the programs?

General ABRAHAMSON. I am not saying that. You have a very, very difficult choice.

Senator WARNER. We sure do.

General ABRAHAMSON. Whatever number you all decide, then we will find a way to adjust it. However, I do want to try to get across there is a very difficult interrelationship between each of these. My next chart will begin to show that.

Senator WARNER. Keep in mind sooner or later, and maybe you cannot or won't answer it, but sooner or later somebody on this subcommittee will ask, OK, we have to take a percentage, 25 percent, off that figure of $3.7 billion.

Where will you take it from? If I were to ask you that question, could you answer it?

General ABRAHAMSON. We would have to do a lot of work in terms of various tradeoffs as we did last year in order to absorb some of the cuts.

My plea would be this, sir. There are people in the Congress and in the staff who report to Congress that have some very strong feelings about what they think is the right system to go forward with.

We don't mind that kind of guidance and if people wish to write in special guidance or examinations, we will respond to it.

Obviously, that is not only a right, but it is your responsibility. However, I am making a plea against micromanagement which I think is incorrect. I think many people here, even though they have part of the story, don't have the full story.

I would plead that if you have to make cuts, please make them unspecified across the entire program and let us find the most optimum way to make the cut.

Senator WARNER. You are saying if you have to make cuts, don't say I am going to cut out this, that or the other thing?

General ABRAHAMSON. Yes, sir.

Senator WARNER. If the cut is 25 percent, you would prefer to have that across the board and let you go into the program.

General ABRAHAMSON. I would prefer not to have 25 percent across the board.

Senator WARNER. I assume you don't think that we should take money out of the B-1 bomber or Stealth technology to put into this?

General ABRAHAMSON. I have to make the best case possible for my program. I would like to stress that the Department of Defense has already made some very, very tough decisions and has funded it at a very, very high priority, of course.

I can't speak for the Secretary about where he would prefer to take those various cuts; that would be improper, because those are also important programs.

Senator WARNER. Thank you.

General ABRAHAMSON. Here you can begin to see the way these things interact. You remember I indicated one of the mature technologies that allow you to get into boost phase. It is simply a large rocket fired in orbit.

[Slide deleted.]

[Deleted.]

In the front of it, you have the reduced version of the homing overlay intercept. That is a good example of a fairly straightforward and mature technology that could go early in the program.

Senator EXON. All it is, is a gun in space?

General ABRAHAMSON. That is right. We really have to get it at pretty high speed, [deleted] but we think we can do that.

This could be applied earlier. It could work in boost phase. The same weapons that are in a position to fire down in boost phase, but are coming down behind that could fire in boost phase and the same satellite coming behind that could fire in midcourse.

There is one weapon on that could independently operate at all three layers. However, in order to bring that forward, and I think this is the key point, in order to make that system work, we have to have in surveillance and acquisition some kind of tracking and surveillance capability that is reasonably accurate.

[Deleted.]

In order to develop [deleted] these systems, we have to develop such things as radiation hard, large-scale integrated circuits. We have to be able to discriminate. So, we have to do some experiments against targets and background.

All of these things must be survivable. We have to develop new kinds of [deleted] optics and long-wave infrared systems.

There is a great deal of technology behind the support system even though that is mature.

But that is not enough. That is a kinetic energy system. All my pointing and tracking activities are in the directed energy area. Therefore, the pointing and tracking that would allow you to do

this, even though it is not terribly accurate, pointing and tracking has to be developed here in my directed energy line.

I will show you some of the things in this line that have to be developed and are part of that system itself, but behind that we have to understand the lethality of those systems and, therefore, there is money in the lethality.

The platform itself has to survive for a period of time at least and, therefore, that is important. We have to be able to have cost-effective space transportation in order to get that up there.

So, that has to be developed. We have to have the space power that will work.

Finally, we have to have a battle management C^3 system. Even though this appears to be a simple and straightforward weapon as you go across, we have to carry a great deal of technology forward in order to implement that system.

Senator EXON. Therefore, the point you are making is that you don't want the Congress to say cut out this because if you did, it might put a hole in the whole thing?

General ABRAHAMSON. That is right.

[Slide deleted.]

WORK PACKAGE DIRECTIVES

I will give you some examples. The program is made up right now of 153 work package directives. These are ways in which I sign a contract which the services and various agencies.

They have hundreds of projects in these contracts. Even though that is a huge number in 1986, they finally begin to break down this way.

This is a multiple kill vehicle. It is a very small vehicle here. You can see in 1985 we are going ahead with a concept design and work on several of these basic components. But now we are at a point where we have to begin to make hardware and begin preliminary design in many of these areas.

So, for that one system to work, I have to be able to step up rather smartly between those two.

Now, many people are not aware that we have very specific technology requirements laid out across the program. Mr. Abernathy asked that I point them out and there they are. They have quite specific goals. Some of these could be affected. For example, so many hundred meters per second to burst.

That means, can this system have enough propulsion to be able to get off at high enough speed so that if it is coming in off the track, it can veer over and intercept the missile.

Some of them started slowly this year. They have to work up again. Some of them are fairly large chunks. Some are such tiny programs there has to be a certain basic level of funding or these programs can't go ahead.

Here are more of them as they begin to jump up. In each case we have a goal established. We know exactly what we are driving for in order to make them work.

This one is the one that allows you to get up to that [deleted]. Even though these kinds of technologies are fairly well understood, it is a challenge to put it together.

[Slide deleted.]

The move from satellite to infrared surveillance. This is the positive side of the story.

In order to be able to put those satellites up there to give it that surveillance and capability, we have a broad range of technology programs and they are technology programs. They all have to come together at the right time and place.

New detectors, large arrays where we have [deleted] of detectors, more than we have ever had before, in an array that is of a size that it can go in a satellite.

Light weight mirrors, and, by the way, these are all pictures of real technology today. I am trying to get across this is not theory, these are real programs. These are pumps and I will show you some of the things are infrared focal points.

Electronic kits that have to be developed. We know exactly what we are trying to do here. We know exactly the kind of money that it should require.

If we have to make adjustments, then what happens is that we have to take many of these long programs and squeeze down or chop out one large program.

[Slide deleted.]

This shows the size. Here is one of those trunks. Infrared systems cannot work unless you get it cooled down [deleted].

In this case we are trying to get down here to some very, very small temperatures. You can see we are dealing with very, very small programs finishing out this particular kind of refrigerator to bring the cost down.

Many of these are not plausible. That is my whole point. If you are going to test it, you can hardly get down below that very, very small size.

[Slide deleted.]

Now, that is the plus side. We have a lot of programs to do that.

You also have at the same time to understand what the Russians can do to stop it. [Deleted.]

Now, we can't test in the atmosphere any more. So, [deleted].

We are building out at the Sandia Corp. an extensive program which allows us to calculate theoretical limits associated with this kind of thing.

[Slide deleted.]

Here is an output of that program. It says if you put a sensor in an airplane, which is one of our programs, and you want to be able to see, how well can you see? [Deleted.]

So, here is an example of one of the kinds of outputs. It is not the only one.

Senator WARNER. Let me get that more clear in mind.

[Deleted.]

General ABRAHAMSON. [Deleted.]

[Slide deleted.]

[Deleted.]

Senator WARNER. General, I don't understand that.

General ABRAHAMSON. I may be going too fast.

Senator WARNER. This is an [deleted.]

General ABRAHAMSON. [Deleted.]

Senator WARNER. [Deleted.]

General ABRAHAMSON. [Deleted.]

Our job is to make sure that we understand what they can do theoretically and can that stop the kinds of systems that we are after.

Senator EXON. [Deleted.]

General ABRAHAMSON. Yes, sir.

Senator EXON. [Deleted.]

General ABRAHAMSON. Yes, sir. [Deleted.]

The question is: Could that throw off that system? We are testing and working to understand precisely that kind of problem.

Those all have to be funded and they are funded in that surveillance, acquisition, and tracking.

Senator WARNER. [Deleted.]

General Abrahamson. [Deleted.]

I guess I would like to get across to you some confidence that we understand that, that we need to understand it better and that we are not just ignoring these kinds of questions. They are very serious questions that we are trying to answer as part of our responsible research program to assure that they can't find a simple way to overcome our warhead. That is the real message.

[Deleted.]

[Slide deleted.]

[Deleted.]

Senator WARNER. [Deleted.]

General ABRAHAMSON. [Deleted.]

We are working on it. It all takes money and there are teams out there and those teams are just in a very dedicated way moving on this program.

People don't understand the breadth and depth of what we are about. We are finding answers how to stop that business.

[Slide deleted.]

I have shown both of you these in some of the unclassified things. This is a ground-based laser. This is one that we are prepared to go forward with much faster because we are bringing down the cost of laser power so very effectively.

If we have the resources next year, we will in fact be bringing this forward. We have brought the cost down from between $3 and $10,000 per joule of output.

The light coming off this right now is probably somewhere near [deleted.] That used to cost a lot in the old days, $10,000. On this system we have already brought it below $50. Our objective is to bring it down below $5 and maybe down in the order of $1.

We don't know that yet, but we are prepared to march forward to do that. On this one we have already made great progress, so great we have a team identified that is so creative out there, a small business outfit in California, that we are prepared to really accelerate this particular program.

Again, it depends on the resources, how fast we can accelerate it. I think we can build the biggest groundbased laser that anyone can imagine in between 3 and 5 years' time if we have the resources.

[Slide deleted.]

We have this one out at White Sands. This is the building that has been built there, a high energy laser test facility. [Deleted.]

[Slide deleted.]

[Deleted.]

Senator WARNER. What is the reaction in the chemical laser?

General ABRAHAMSON. All of the lasers do one particular thing. They send out a [deleted] pencil beam of light. Of course, that light burns its way through.

For many different kinds of atoms and molecules that are certain energies and those energies are vibrational kinds of things.

It says that an atom will vibrate in a particular way or that molecule will vibrate in a given way and it will give off energy in the form of light.

The key is that it always goes in the same direction it started. In the laser we have light going back and forth so it started in only one direction to build up power.

[Slide deleted.]

Here is a neutral particle beam you talked about. It is an atom of hydrogen. Out of this end of the gun is an atom of hydrogen. [Deleted.]

It is neutral because it doesn't have a negative or positive charge. This exists today in the Los Alamos Laboratory.

We are making great progress. We are examining the possibility of going faster as we go ahead with that part of the program.

[Slide deleted.]

This is a kinetic energy gun. This today fires out of the University of Texas. For the first time in history we fired multiple shots of this in November.

[Deleted.]

So, here is a team out at Livermore that has done marvelous work in the program.

[Slide deleted.]

I also would like to point out that here is the only area that we have what could be construed to be an operational requirement that has dates associated with it. [Deleted.]

It is reasonably crude technology. They are relying on us in our programs to develop a [deleted.]

Therefore, it is our program that goes well beyond just our own operational requirement, but upgrades the operational requirement [deleted].

The Chairman of the Joint Chiefs of Staff reminds me all the time about this, General Gabriel and others. [Deleted.]

Here is an operational requirement which is another reason that we have brought it into our program.

[Slide deleted.]

They are doing a pretty good job, I believe. In 1985 our actual obligations are already running at the end of the first quarter at some 37 percent. Now, that is our first 3 months of operation.

Senator WARNER. Thirty-seven percent of what?

General ABRAHAMSON. Thirty-seven percent of our total appropriation.

Senator EXON. You are overspent according to the quarterly?

General ABRAHAMSON. That is right. That does not mean it is not orderly.

Senator EXON. I know it is orderly.

General ABRAHAMSON. What I am trying to find out is could we as a new organization working through all of these organizations in

the Department of Defense, set up an operational system that we can get the efforts on contract and properly expend this money and obligate this money in a way that is responsible, not irresponsible.

Senator EXON. I would say, General, I wouldn't mind the Soviets seeing that chart, but if David Stockman sees it——

General ABRAHAMSON. If I can give you a comparison, sir, there is no other agency in the Department of Defense that I am aware of that has the multiple kinds of problems that we do that is anywhere near our obligation rate. I think that is a key point in the question.

It is really a credit for the teams that are out there on the job.

[Slide deleted.]

I would like to end with one more point.

We are not only in the forefront of technology and moving technology again, we are trying to find ways from a business point of view that we can introduce new concepts, new business concepts and new procurement concepts.

HORSE RACE CONCEPT

We are experimenting in that area just as well. One of them, and I am very pleased with it, is called our horserace concept. We started that as a way to bring in industry to assist us in trying to make examinations of how far technology can go, how fast it can go and where the real cost leverage is associated with that technology.

That is the key question: Where is that cost leverage? Where is the technology going to begin to go so that it is going to go crazy and possibly cost us too much and we will not be able to present to this body and to others in the future, a practical limit?

So we have invented a new kind of procurement concept where we now have 10 teams composed of 20 different contractors with only a small amount of money, $1 million in each of these contracts. They are in a horse race.

When I say it is a horse race, they know it is absolutely real. They are trying to produce as fast as they can and they know if they do not produce not only high quality work, but produce it as quickly as possible, they will not be able to go forward into the next phase of the program.

We have found a way to do that so that they don't have to stop while we issue a new RFP.

We want to make sure they have the best people and they keep those best people in the program. So, this concept is one where we eliminate contractors for poor performance. The ones who would get there the "firstest with the mostest" kind of thing.

General Custer back in the Civil War put it well. You get to go ahead because you have the right team and we are doing it well. They may have a capability, but if they get there too late and they don't get there as quickly as other teams, then they are not as effective for us. So, they lose out, too.

So, we have really invented this concept of a horse race procurement which is underway. It is the first time anybody has tried this kind of procurement and it won't be across the board, but we do

think it is an experiment in business management that ought to be pursued.

Senator WARNER. I told you before that you have been most patient. I want to raise with you a very mundane item. It is one of those things we have to deal with.

Witnesses this morning said in the context of the SDI program that any concept of an umbrella over the cities, and so forth—I don't know what adjective they used, but they said would be inefficient because you could bring the bomb in in a keg of marijuana.

Jim Exon and I have to be on television. I will be on for 1½ hours tonight addressing the SDI program.

How do you deal with that question? Is there some logic behind it?

General ABRAHAMSON. Of course, there is.

I don't believe any of us have ever thought that SDI is or that there is any way to stop the terrorist kind of attack, but a terrorist attack is not one that can destroy our entire society.

It is very difficult to be able to pull off a major attack of that kind and destroy our military targets as well as the cities. So, the threat to our society as a whole is the military threat posed by the tremendous buildup of the Soviet offensive capability and that is what we are trying to handle.

Senator WARNER. The next question goes to the point that we made a decision—when did we abandon Grand Forks?

General ABRAHAMSON. In 1974.

Senator WARNER. The logic behind abandoning that, what has happened since that period to have enabled us to contemplate a 180-degree reversal?

General ABRAHAMSON. I think that the fundamental change is technology itself. The technology associated with that particular kind of defense was the technology of a terminal defense and it was nuclear and it was old radar technology.

I believe that we had enough questions about that technology that it was not unreasonable to abandon that defense at that point in time.

Since that time we have made this tremendous step forward not only in lasers and these kinds of systems, but more important, in computers. With the tremendous step forward in computers and software and what we can do there, I believe that has changed the whole picture from a technology point of view and, therefore, does make it worthwhile to be proceeding with programs to exploit those emerging technologies.

Senator WARNER. The only nuclear component of SDI I am aware of at this time is the power source for certain lasers, and that would not presumably have an adverse effect on humanity or any other adverse effect.

I presume that because it is nonnuclear there is far less deleterious effect on the atmosphere and mankind with this system, is that correct?

General ABRAHAMSON. Yes, sir; we believe that is the case.

We believe also with many of the problems with the deployment and that kind of thing that the MX invites those kinds of concerns.

However, I want to be very straightforward. If there were a full-scale attack, at least for some of these concepts, the bombs would

probably go off, but they would go off in space which is very different from going off on the surface of the Earth.

In fact, we think that would have very little effect on all of us, certainly not the kind of basic question of survival of civilization. We don't think that is an issue at all.

We have not ignored that problem. We are trying to work on ways that would even obviate a bomb going off. But I would be too optimistic in promising that I know that will work out.

Senator WARNER. Senator Exon, do you have some questions?

Senator EXON. General, as usual, we find your briefings interesting and intriguing and always well done. I compliment you. I have the greatest confidence in your ability.

I have checked into your background. You come with excellent credentials.

I think the way you are moving ahead on this program deserves the thanks and confidence of all of us. I know I speak for the Chairman.

Senator WARNER. Absolutely.

Senator EXON. I will try to help out in this program as I have in the past. Again, I wonder about the total dollars connected with it, but that is not your problem, that is our problem. I keep mentioning that because it is a problem.

As you go through this and you talk about the horserace approach, I think that is great, I think that moving ahead aggressively to see what we can to in this area is prudent. The quicker we can find out what we can or cannot do, the better off we will be to make intelligent decisions on just what to do with this whole proposition. It seems to me, though, that the racetrack approach could result in some confusion, perhaps redundancy in effort.

I assume that a technician or a scientist in Livermore Laboratory might not know what is going on in some other laboratory. Also, I am concerned about security.

Certainly, the Soviets must be working their way into some of these facilities with intelligence collection efforts. That worries me a great deal.

Are you giving a sufficient amount of time to protecting SDI knowledge from the Soviets?

How many thousands of people know part of what you have shown us today?

General ABRAHAMSON. Quite a few. We believe, sir, that there is a range of activity, some of which can be, and it is important that it be unclassified, but there also are important programs that are not only just classified, but are very, very deeply buried in a layered security concept, which are very, very critical.

So, we have now initiated an effort, and I will have to say only in the infant stages, but it is particularly important because soon I suspect we will have the Europeans and our other allies involved in the program as well.

I do believe that the only way we can protect properly the program, not only with our allies, but through our allies and with our own society as well, is to have a very layered approach.

So, we are trying to set that up and I can show you now where we have several programs that are already in the special access category. I have kind of hinted at some of those this morning.

Senator EXON. When you say layered----

Senator WARNER. General, I must depart. I want to thank you very much for your appearance.

General ABRAHAMSON. Thank you.

Senator EXON [presiding]. You are thinking of layered approach to security and not layered approach to defense systems?

General ABRAHAMSON. There are some that should be unclassified. People can work on it more effectively, and, second, because it is important that the Soviets do understand that we are making prograss in certain layers.

Senator EXON. Again, the concern I keep raising, we can layer our intelligence, but theoretically if the Soviets can get into all of these plants and all of these facilities, they can piece together important information.

[Deleted.]

Your answer, I suppose, would be that this is so much more diversified. One breakdown, one serious breakdown in security would not necessarily disclose the hole of the doughnut to the Soviets?

General ABRAHAMSON. That is correct. [Deleted.]

Senator EXON. With regard to [deleted], it seems to me that there won't be as many companies involved.

General ABRAHAMSON. There are many who can contribute. The choice will be to get them down to only a few that we can deal with.

Even then, I don't think we should have that out in all of the companies. That should be very carefully protected.

Senator EXON. More in the military area?

General ABRAHAMSON. Yes, sir.

Senator EXON. General, you have been very patient and very interesting. I can only thank you again for the time and attention you give us with all the other important duties that you have to perform.

With that, we are adjourned.

General ABRAHAMSON. Thank you.

[Questions to be answered for the record follow:]

QUESTIONS SUBMITTED BY SENATOR JOHN WARNER

ANTITACTICAL BALLISTIC MISSILE SYSTEM

Senator WARNER. General Abrahamson, could the United States develop an anti-tactical ballistic missile system within the constraints of the ABM Treaty?

Is this type of a system technically feasible?

Does the SDIO contain the technical capability to develop such a system?

General ABRAHAMSON. Yes. Since the ABM Treaty applies to systems "to counter strategic ballistic missiles or their elements in flight trajectory" (ref: ABM Treaty, Article II) an anti-tactical ballistic missile system could be developed within the constraints of the ABM Treaty. The key phrase is tactical. This type system is technically feasible and SDIO is one of the organizations that contains the talented technical people who could pursue this type of work. However, there are other agencies which also contain that capability.

Senator WARNER. General Abrahamson, would you identify systems under development in your program for which important requirements exist quite aside from their application to the SDI?

General ABRAHAMSON. We are engaged in many research programs which have requirements outside SDI. Three programs I would like to mention are the free electron laser, gallium arsenide chips, and the optical signal processor. The free electron laser has potential uses in medicine, the gallium arsenide chips are part of the ongo-

ing revolution in computer chips and the optical signal processor will be a breakthrough in communication, data processing and decision making capability.

Senator WARNER. In view of what appears to be the Soviet preparation of a territorial ABM defense, how specifically does the SDI provide hedges to deter such a breakout and actual response options if this should occur?

General ABRAHAMSON. The research we are engaged in is focused to provide the United States with the potential to defend against a ballistic missile attack. The fact that we are engaged in this research is a hedge against a unilateral breakout by the Soviets. Since we are pursuing a total spectrum of potential technologies the Soviet military planner cannot be sure he is solving the right problem. This indecision is a deterrent against attack.

[Whereupon, at 12:45 p.m., the subcommittee adjourned, subject to the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1986

TUESDAY, MARCH 19, 1985

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

STRATEGIC DEFENSE INITIATIVE

The subcommittee met in open session, pursuant to notice, at 9:17 a.m., in room 222, Russell Senate Office Building, Senator John Warner (chairman) presiding.

Present: Senators Warner, Thurmond, Nunn, Hart, Exon, Levin, and Glenn.

Also present: Arnold L. Punaro, staff director for the minority; Robert G. Bell, Robert F. Bott, Douglas R. Graham, William E. Hoehn, Jr., George K. Johnson, Jr., professional staff members; Russell C. Miller, research assistant; Karen A. Love, staff assistant.

Also present: Romie L. Brownlee, assistant to Senator Warner; Henry D. Sokolski, assistant to Senator Quayle; Mark J. Albrecht, assistant to Senator Wilson; Janne E. Nolan, assistant to Senator Hart; Jeffrey B. Subko, assistant to Senator Exon; and Phillip P. Upschulte, assistant to Senator Glenn.

OPENING STATEMENT BY SENATOR JOHN W. WARNER, CHAIRMAN

Senator WARNER. The subcommittee convenes in open session this morning to continue to receive testimony on the President's Strategic Defense Initiative in review of the fiscal year 1986 Department of Defense authorization request.

This will be the final opportunity for the subcommittee to hear from public witnesses on this important subject before the committee begins its markup for the fiscal year 1986. We will be conducting one final hearing in closed session to receive the most recent intelligence information on what appears to be Soviet preparation of a territorial ABM defense.

Our first witness this morning is Dr. Schlesinger, currently counselor at Georgetown University's Center for Strategic and International Studies.

We welcome you, Doctor.

Mr. Hart, do you have an opening statement?

Senator HART. Mr. Chairman, I want to thank you and the staff again for helping arrange to have public witnesses, including those who have raised what I think are very constructive questions about the Strategic Defense Initiative. I cannot think of any two people better qualified to be before us this morning on this issue than Dr. Schlesinger and Dr. Drell, both of whom have long and distinguished careers both public and private and have given a great deal of their lives to the question of this country's national security. I join you in welcoming them and look forward to their testimony.

Senator WARNER. Thank you very much.

Senator Glenn?

Senator GLENN. Thank you, Mr. Chairman. I do not have any opening statement.

Senator WARNER. Dr. Schlesinger, you may proceed.

STATEMENT OF DR. JAMES SCHLESINGER, COUNSELOR, CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES, GEORGETOWN UNIVERSITY

Dr. SCHLESINGER. Mr. Chairman, I have no prepared statement. I am prepared to respond to the subcommittee's questions, or there are some introductory comments that I might make, if you wish.

Senator WARNER. If you would proceed with those, please.

Dr. SCHLESINGER. Mr. Chairman, the Congress, the U.S. Senate, has an opportunity to restore some degree of sanity to the issues that are currently being deliberated, as the discussion of strategic defense has, to a large degree, gotten out of hand.

Henry Kissinger just a few weeks ago described the SDI as a "slogan in search of a program."

There is, I believe, Mr. Chairman, a prudent and moderate position with respect to what should be done. In the first place, we can continue research on strategic defense. I say this with some care, because I am not referring to the Strategic Defense Initiative here. We have been doing research on strategic defense since the time of the ABM Treaty, and we have been doing it for good reason. We have wanted to hedge against the possibility of Soviet breakout, and we have wanted to keep abreast of what the Soviets might be doing in their own program.

This was a valid reason for research in this area and it continues, it seems to me, to be a valid reason for research.

Second, there is that aspect of strategic defense that constitutes the Initiative, sometimes labeled as "Star Wars." I believe that some research effort on this program is also appropriate.

Third, it will be an issue for national policy to reconsider the question of terminal defense. In the years since 1972, there have been substantial changes in the international environment. The Soviets have developed a counterforce capability far more massive than we thought likely in 1972, and at the same time technology has changed.

So I think that the issues that were resolved in 1972 are due for reconsideration.

I would point out, Mr. Chairman, my own judgment that the burden of proof would rest upon those who would upset the ABM

Treaty. However, because of changes that have taken place, I think a review of that national decision is appropriate.

Now that is a modest program, Mr. Chairman, and it has been exceeded by a vast degree by the rhetoric that we have seen. Indeed, it has almost been drowned out by the rhetoric.

The rationales that have been offered for the Strategic Defense Initiative are highly confused and are contradictory.

There is the latest White House rationale—and I stress that this is the White House rationale, because it does not always agree with what the President has been saying; the President sometimes differs from the rationales issued in his name by the White House—that all that SDI is is a research program.

But that statement, that it is only a research program, is belied by the fanfare that has been associated with the program, a subject on which I will dwell in a moment.

It seems to me that it would be a desirable thing if the Congress could help to deflate the exaggerations involved in this program and get rid of the fanfare.

SDI—A TECHNOLOGY PROGRAM

Let me stress that the White House rationale, the current White House rationale, is, indeed, correct. It is at this stage only a technology program. That is all it is and that is the way it should be treated. It should be treated like a research program. And for research programs, technology efforts, what we normally do is to withhold judgment until the technical uncertainties have been resolved. And this withholding of judgment in the space of the spaceborne strategic defense will require us waiting 10, 15, or 20 years to resolve those technical uncertainties.

The hoopla has gotten well ahead of the program.

I think that this withholding of judgment is particularly appropriate in this case because this is not a normal development program. The critics say that there is no chance that we can achieve what the President has laid out as our goal, and the defenders of the program say there is only some chance, some possibility. This is not a program that is marked with high confidence for successful resolution.

Now, instead of treating this technology program that is appropriate at this stage, in all of its modesty, we have had people who should know a good deal better, daydreaming about the future and building, as it were, strategic castles in Spain. I hope that is not a mixed metaphor.

We have people who are now writing learned essays on the transition from Mutual Assured Destruction to Mutual Assured Survival; learned essays about Mutual Assured Survival when, as yet, we do not know what Mutual Assured Survival may be. It has not as yet been defined.

We have in these learned essays an attack on deterrence, an attack on deterrence as immoral, with arguments apparently stolen from the Catholic Bishops by those who, incidentally, objected to the Bishops when they originally issued their statements.

Now I would underscore, Mr. Chairman, that at this stage, to attack deterrence as immoral is reckless and pernicious. It under-

mines the security not only of this country, but of the Free World and, notably, of Western Europe.

Till the end of our children's lifetimes, at the earliest, our security will continue to rest on deterrence. For members of the administration to join in the attack on deterrence as immoral strikes me as quite irresponsible.

Mr. Chairman, in this connection I think it might be well to include in the record a speech given by Sir Geoffrey Howe just last Friday in London.

Senator WARNER. Without objection.

[The referred to speech by Sir Geoffrey Howe follows:]

(The following is the final text of a speech prepared for delivery by foreign and commonwealth Secretary Sir Geoffrey Howe to the Royal United Services Institute in London on Friday 15 March 1985:)

The renewal of the U.S.-Soviet negotiations, and the current discussion of new weapons and technologies related to outer space, combine to make this a timely moment to explore the way ahead. I welcome this opportunity to do so, and I am grateful to the RUSI for providing this occasion.

As my theme I have taken defence and security in the nuclear age. The Western Alliance has always emphasised its wholly defensive character. Repeatedly, we have pledged ourselves never to use any weapons except in response to an attack. The North Atlantic Treaty commits each of us to defend ourselves and our allies. The options for doing so have been debated for the past generation. It is my purpose today to review those options, to explore the relationship between defence in its broadest sense and systems intended to defend against nuclear weapons, and to highlight the issues our alliance must tackle if its success in ensuring peace is to continue.

Forty years ago, the nature of warfare between major powers was irrevocably altered. The extent of this revolutionary shift in international affairs has taken a long time to sink in. It was Einstein himself who said: after the dawn of the nuclear age, everything changed except our way of thinking.

Gradually we have learned to think differently, to realise as Bernard Brodie once put it, that thus far the chief purpose of a military establishment has been to win wars. From now on, its chief purpose must be to avert them. Here is the core of the paradox of deterrence. But how to avert? How to manage the existence of nuclear weapons so as to ensure that they never have to be used?

Some suggested that the West should cut the gordian knot by surrendering all its own nuclear weapons and trusting in the good intentions of the comrades in Moscow. Such a strategy found little favour in the West, apparently it was never even considered in the East.

A second alternative, the idea of a pre-emptive first strike, was and still is rejected with equal firmness by the peoples and governments of the West.

The remaining option—to maintain a level of forces, conventional and nuclear, which would present a credible defence against any attack and make aggression pay an unacceptable price—was the almost universal choice. Deterrence based on the whole spectrum from conventional to nuclear forces became the basis for the defence of this country and our allies.

We have lived with that choice, the decision to deter the enemy rather than attack or surrender to him, ever since, this government and all its predecessors have supported it wholeheartedly. And we have enjoyed 40 years of peace. Rather than die by the nuclear sword, we have lived by the shield of deterrence.

The nuclear age was born out of new technology. And the development of technology has not faltered. This is a fact of life in the twentieth century. Twenty years ago, the prospect of limited defences against the nuclear threat began to emerge. Simultaneously, even the theoretical possibility of a successful pre-emptive attack began to disappear. Technology created survivable forces which were capable of riding out any attack, even by nuclear weapons, and still retaliating in a second strike. In addition, the concept that negotiations between adversaries could actually limit, and eventually reduce, the levels of forces on both sides—and thus enhance the stability of deterrence—assumed a new importance.

Thus it was that in 1972 the United States and the Soviet Union reached an historic agreement, the ABM Treaty, this was the intended basis for the future strategic balance. Under the ABM Treaty the United States and the Soviet Union committed themselves for an unlimited period to restrict active defences against the nu-

clear threat from ballistic missiles to a very low level—so low that the United States subsequently decided that any deployments of such defences were not worth pursuing. The Russians, for their part, provided only for a limited protection of Moscow.

The ABM Treaty reflected the agreement that there could be no winner in a nuclear conflict and that it was a dangerous illusion to believe that we could get round this reality. At the same time, the first SALT agreement set limits on the future expansion of nuclear forces.

The net effect was to eliminate the option of full-scale deployment of defensive systems, perceived in 1972 to be destabilising, costly and in any case ineffective, and to enhance the strategy of nuclear deterrence through the clear recognition of mutual vulnerability.

The common acronym for the latter is MAD. In my view the D should stand for mutual assured deterrence, not destruction. This Government, in exactly the same way as its predecessors, is not committed to destruction. It is committed to preserving peace, by ensuring that potential aggressors are deterred from threatening it. We are confident that this will continue to be effective. So long as would-be aggressors are faced with the credible prospect of unacceptable damage in return.

To return to the historical analysis the march of technology continued. As limits were placed on some elements of nuclear forces, others began to multiply. Any assumption that the Russians would match in the 1970s the degree of self-restraint demonstrated by the Americans, proved ill-founded. Over the past 15 years, the Soviet Union has been improving and modernising its strategic forces to a much greater extent than the United States. As a result the Soviet Unions weapons are in general much newer. It is currently developing and testing a new generation of ICBMs and SLBMs, a new strategic bomber, and a complete new family of cruise missiles. While the United States perhaps retains a slight advantage in overall warhead numbers, the Soviet Union has more delivery systems. It also has more warheads on its missiles, and it has nearly three times as much throw-weight.

There is no doubt that the present Soviet capabilities cause justifiable concern on our side their build-up over the past decade goes far beyond the reasonable requirements necessary for the defence of the Soviet Union. It is in the light of this Soviet programme that the United States and its allies felt compelled to take steps to modernise their own forces.

In intermediate range nuclear forces (INF), there is still a marked imbalance in favour of the Warsaw pact, despite the belated deployments by NATO of a limited number of ground-launched cruise missiles and Pershing IIs. The continuing build-up of SS20s remains of particular concern. Major improvements are taking place in Soviet shorter range dual-capable systems, improvements are also under way in Soviet battle-field nuclear artillery.

In 1985 we now face once again a range of options to preserve our defence into the next century.

We could disarm and throw away our own weapons. To do so would be to rob ourselves of the chance to negotiate balanced reductions with our adversaries, or to exploit the new advantages which technology may have to offer.

Alternatively, we could indulge in a new orgy of armament. This would mean seeking a dubious safety in levels of forces far above the minimum we now believe necessary to prevent attacks upon us.

The Government reject both these courses.

Evidently, we still have the third option: to maintain sufficient forces to deter any aggression against us and our allies, and to seek at the same time balanced reductions in these forces on both sides. Deterrence must remain credible, while the political, strategic and financial costs of maintaining such levels is reduced. Despite weaknesses in some areas. I believe that present and planned US and NATO nuclear forces provide a stable balance of deterrence and will continue to do so. I emphasise that the Western modernisation programme is an essential factor in maintaining this balance. It is no good accepting the principle of deterrence and then failing to will the means needed to maintain the effectiveness of the deterrent.

And now, with President Reagans strategic defence initiative, a fourth possible option has been re-introduced, after more than a decade in limbo. The strategic debate is focussing on new possibilities for active defence against the nuclear threat.

In our approach to these new issues the Government believe that certain well-tested premises retain their validity: the need for strong and credible military forces, the need to maintain deterrence, and the need to pursue arms control measures. The four points agreed last December at Camp David between the Prime Minister and President Reagan, and reaffirmed during their Washington discussions last month, are of prime importance in this context. These points are by now famil-

iar. But as they represent the basis for the British governments approach to the strategic future, their re-statement is in order.

As the Prime Minister has said, she agreed with the President that:

The U.S. and Western aim is not to achieve superiority but to maintain balance. Taking account of Soviet developments.

SDI-related deployment would, in view of treaty obligations, have to be a matter for negotiation.

The overall aim is to enhance, not undercut, deterrence, and

East/West negotiation should aim to achieve security with reduced levels of offensive systems on both sides.

Thus our policy as we face the new challenge continues to be consistent. But what are the real problems to be resolved and the new questions to be answered?

President Reagan, in the historic address which launched the strategic defence initiative almost two years ago, spoke of his vision that new technology might make it possible to create comprehensive defences against nuclear attack. These could render ballistic weapons impotent and obsolete, they could free the people of the world once and for all from the threat of nuclear annihilation.

From the start, such a vision was always recognised as subject to uncertainty. As the President himself said in March 1983, it will take years, probably decades of effort on many fronts. There will be failures and setbacks just as there will be successes and breakthroughs. Subsequent statements in Washington have underlined the tentative nature of the venture.

Nonetheless, the Presidents vision has already made a decisive impact in several respects. It has focussed interest on military activities in space, and on new weapons systems which might theoretically be deployed or aimed there. It has also drawn to public notice the very considerable research under way in the Soviet Union on a range of potential defensive measures.

Not enough attention has been paid to this Soviet research. It is extensive and far-reaching and has been going on for many years. Any discussion of future Western strategies must take full account of it. To ignore or to dismiss what is happening in the Soviet Union would be not only myopic, it would be dangerous.

Given the dimensions of space, it is hardly surprising that imaginative schemes for its military exploitation have been almost infinite. So too have been the misconceptions and distortions of what is happening now, and may happen in the future. To use terms such as Star Wars about either US or Soviet intentions is to distort the very real problems and their potential solutions.

Equally, in Soviet calls for the de-militarisation of space I see more propaganda than substance. Activities in space with military relevance are not by definition evil. It is neither feasible nor desirable to try to preclude all of them. Current Soviet rhetoric makes a less than serious contribution to a most serious debate. Greater precision and deeper thought are required. For a start we must distinguish between present military activities in space and those that may at some far-off point in the future achieve reality. And at all times we must keep in mind the key question: will new developments enhance or undercut deterrence?

At present, space is used by a limited number of military systems, on both sides.

First communications and surveillance satellites, which add significantly to the effectiveness and credibility of Western defences, and thus to their deterrent effect. Efficient and cost-effective, they provide a unique contribution to the defence of the West.

Second, re-usable launchers. These pack-horses of the space age are equally valuable. Nor by their nature do they pose a real threat of aggression. The shuttle is too limited, too costly and too vulnerable a platform for that purpose.

Third, there is the potential use of space for the delivery of nuclear warheads by ballistic missiles. We must seek to ensure that this will always remain an unrealised potential.

Lastly, we face the problem of anti-satellite systems, exacerbated by the Soviet deployment over the past decade of a limited capability in this field. It would be a serious blunder if the West allowed the Russians to continue to enjoy their present monoply.

The U.S. intention to balance the established Soviet capability in this field is logical and prudent.

On the other hand, we must recognise the heavy Western dependence upon the existing utilisation of space technology and particularly upon satellites for intelligence purposes. We must also recognise that the prospect, at a time of crisis, of either side being faced with the loss of its strategic eyes and ears would be gravely de-stabilising. It could provoke a new and even more threatening stage in any East-West confrontation.

The West must therefore strive to make its satellites less vulnerable. But there may equally be good grounds for negotiating some constraints upon elements of anti-satellite activity. I welcome the readiness expressed by President Reagan at the U.N. last September to consider mutual restraint while the negotiations which have now been launched explore possibilities for concrete agreements.

One other factor must be recognized: the linkage between the development of anti-satellite capabilities and the potential development of defences against ballistic missiles. It could be argued that by imposing constraints on anti-satellite activity, decisions on the development of ballistic missile defences would be pre-empted before they could be properly considered. That however would be to ignore the important differences in the time-scales involved.

In the case of anti-satellite systems, the future is now. The Soviet Union has already deployed such a system at low altitude, and the United States is in the middle of a successful testing programme. By contrast, any development beyond the research stage of defences against ballistic missiles, the most immediate nuclear threat, is in the prime ministers words many, many years away.

The Government take the view that, if negotiations were to succeed in imposing mutual constraints on anti-satellite systems, these could have a helpful impact over a period of years. We should take that oppportunity now, if it is in the Western interest. Any such ASAT agreement could be limited if necessary to a fixed period, in order not to prejudge the future.

Against that background of present space activities, I should like now to consider the longer-term issue of active defences against ballistic missiles, and particularly defences which might be deployed in or into outer space. By active defences I mean systems specifically designed to prevent enemy missiles getting through, rather than deterrence based on the threat of retaliation.

Much has been said and written about President Reagans strategic defence initiative. The first point to make is that, as U.S. spokesman have made clear, this is a research programme, conducted in full conformity with the limits of the ABM Treaty. As a research programme, it is also full of questions. The answers may be clear or obscure. They may not even emerge at all. As the U.S. administration themselves recognize, the programme is geared to a concept, which may in the end prove elusive.

The second point is that treaty obligations specifically allow for research to continue into defensive systems. Evidently, it is pointless to try to impose constraints which cannot be verified. Most activities in laboratories or research institutes come into that category. The ABM Treaty recognised this when it drew a distinction between research on the one hand and development, testing and deployment on the other.

The third, equally important point is that a balance must always be maintained between U.S. and Soviet capabilities, in research as in other aspects. Given what we know of Soviet activities in the research field over a number of years, there is a clear need for the United States to match the present stage in Soviet programmes. It is for this reason that the Prime Minister has repeatedly expressed our firm conviction that US research should go ahead.

But what should happen if and when decisions are required on moving from the research to the development stage?

In evaluating the results of research, and in taking any such decisions, we shall need to ask ourselves some very basic questions about the future nature of Western strategy. In particular, we shall have to consider how best to enhance deterrence, how best to curb rather than stimulate a new arms race. At that stage, the judgements to be made will only partly depend upon technical assessments about the feasibility of defences. Even if the research shows promise, the case for proceeding will have to be weighed in the light of the wider strategic implications of moving down the defensive road.

But can we afford even now simply to wait for the scientists and military experts to deliver their results at some later stage? Have we a breathing space of five, ten, fifteen years before we need to address strategic concerns? I do not believe so. The history of weapons development and the strategic balance shows only too clearly that research into new weapons and study of their strategic implications must go hand in hand. Otherwise, research may acquire an unstoppable momentum of its own, even though the case for stopping may strengthen with the passage of years. Prevention may be better than later attempts at a cure. We must take care that political decisions are not pre-empted by the march of technology, still less by premature attempts to predict the route of that march.

The questions to be faced are complex and difficult. I want to emphasise that they are questions and not prior judgements. The answers will only emerge in time.

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There would inevitably be risks in a radical alteration of the present basis for Western security. How far would these risks be offset by the attractions of adopting a more defensive posture: that is to say, of developing what might prove to be only a limited defence against weapons of devastating destructive force. Could the process of moving towards a greater emphasis on active defences be managed without generating dangerous uncertainty?

Let us assume that limited defences began to prove possible, and key installations began to be protected by active defences. In his 1983 address President Reagan himself acknowledged that a mix of offensive and defensive systems could be viewed as fostering an aggressive policy. Uncertainty apart, would the establishment of limited defences increase the threat to civilian populations by stimulating a return to the targeting policies of the 1950s?

Most fundamental of all, would the supposed technology actually work? And would it, as Mr. Paul Nitze has noted, provide defences that not only worked but were survivable and cost-effective? These are the key questions to be answered by the research that is being undertaken on both sides.

It would be wrong to underestimate the enormous technological expertise and potential of the United States. But, as we all recognise, there would be no advantage in creating a new maginot line of the twenty-first century, liable to be outflanked by relatively simpler and demonstrably cheaper counter-measures. If the technology does work, what will be its psychological impact on the other side? President Reagan has repeatedly made it clear that he does not seek superiority. But we would have to ensure that the perceptions of others were not different.

What are the chances that there would be no outright winner in the everlasting marathon of the arms race? And if the ballistic missile indeed showed signs of becoming, in President Reagans words, impotent and obsolete, how would protection be extended against the non-ballistic nuclear threat. The threat posed by aircraft or cruise missiles, battlefield nuclear weapons or, in the last resort, by covert action? What other defences in addition to space-based systems would need to be developed, and at what cost, to meet these continuing threats?

If it initially proved feasible to construct only limited defences, these would be bound to be more vulnerable than comprehensive systems to counter-measures. Would these holes in the dyke produce and even encourage a nuclear flood? Leaving aside the threat to civilian populations, would active defences provide the only feasible way of protecting key military installations? Might we be better advised to employ other methods of protection, such as more mobile and under-sea forces?

Finally on the technology side, could we be certain that the new systems would permit adequate political control over both nuclear weapons and defensive systems, or might we find ourselves in a situation where the peace of the world rested solely upon computers and automatic decision-making?

Then there is the question of cost. The financial burden of developing and deploying defences goes far beyond the additional cost of providing defences against the non-ballistic missile threat. No-one at present can provide even a guestimate of the total sums involved. But it is fair to assume that these will run into many hundreds of billions of dollars.

We know only too well that our defences must be cut to the cloth of our financial resources. We shall have to ask ourselves not only whether the West can afford active defences against nuclear missiles. We must also ask whether the enormous funds to be devoted to such systems might be better employed.

Are there more cost-effective and affordable ways of enhancing deterrence? Might it be better to use the available funds to improve our capability to oppose a potential aggressor at a time of crisis with a credible, sustainable and controllable mix of conventional and nuclear forces? In short, how far will we be able to impose new burdens on defence budgets already under strain? And what would be the effect on all the other elements of our defences, on which Western security will continue in large part to depend?

The implications for arms control must also be carefully considered. Would the prospect of new defences being deployed inexorably crank up the levels of offensive nuclear systems designed to overwhelm them? History and the present state of technology suggest that this risk cannot be ignored, or could the same prospect—the vision of effective defences over the horizon—provide new incentives to both sides to start at once on reducing their present levels? This explains the importance of the second point agreed at Camp David last December.

In his statement to Congress last month President Reagan spoke of the need to reverse the erosion of the ABM Treaty. It represents a political and military keystone in the still shaky arch of security we have constructed with the East over the past decade and a half. But to go beyond research into defensive systems would be

inconsistent with the terms of the ABM Treaty as it stands. It was agreed at Camp David last December that any deployment beyond those limits would have to be a matter for negotiation. We would have to be confident that that formidable task could actually be managed on a mutually acceptable basis.

We have heard recently from Moscow a lot of dogmatic statements and pre-conditions for the success of the new talks. I discount much of these. But I do attach importance to convincing the Soviet leadership that we in the West are indeed serious in our aim of maintaining strategic stability at significantly lower levels of nuclear weapons. We do not want to give them the impression that we have something else in mind. We are serious about arms control, and we must be seen and heard to be so.

Finally, as members of the Atlantic Alliance, we must consider the potential consequences for this unique relationship. We must be sure that the U.S. nuclear guarantee to Europe would indeed be enhanced as a result of defensive deployments. Not only enhanced at the end of the process, but from its very inception.

Many years of deployments may be involved. Many years of insecurity and instability cannot be our objective. All the allies must continue at every stage to share the same sense that the security of NATO territory is indivisible. Otherwise the twin pillars of the alliance might begin to fall apart.

Other things being equal, we welcome any cost-effective enhancement of deterrence to meet palpable weaknesses on the Western side. But we also have to consider what might be the offsetting developments on the Soviet side, if unconstrained competition in ballistic missile defences beyond the ABM Treaty limits were to be provoked. In terms of NATOs policy of forward defence and flexible response, would we lose on the swings whatever might be gained on the roundabouts?

I have posed a lengthy list of questions, to which the answers cannot be simple. Some do not admit of answers now. But that does not acquit us of the duty to pose them. They are questions so vital to our future that we cannot afford to shrug them off. It is right to ponder and debate them as research continues. In this way we stand the best chance of reaching the right policies. The attractions of moving towards a more defensive strategy for the prevention of war are as apparent as are the risks. It would be wrong to rule out the possibility on the grounds that the questions it raises are too difficult.

But the fact that there are no easy answers, that the risks may outweigh the benefits, that science may not be able to provide a safer solution to the nuclear dilemma of the past forty years than we have found already—all these points underline the importance of proceeding with the utmost deliberation. Recent testimony to the U.S. Congress by Secretary Shultz and Mr. Nitze, and the continual process of alliance consultation, confirm the prime ministers statement last December that the US administration see matters in very much the same light.

Deterrence has worked, and it will continue to work. It may be enhanced by active defences, or their development may set us on a road that diminishes security. We do not know the answer to that question. Meanwhile, four clear points emerge.

First, as the Prime Minister reminded the United States Congress last month, in the words of Sir Winston Churchill: be careful above all things not to let go of the atomic weapon until you are sure, and more than sure, that other means of preserving peace are in your hands.

Secondly, impressions can be created by words as well as deeds. Policies, aims, visions—all these can and must be clearly stated. Without the approval of an informed public, the governments of the West are wasting their breath. But we must be especially on our guard against raising hopes that it may be impossible to fulfil. We would all like to think of nuclear deterrence as a distasteful but temporary expedient. Unfortunately we have to face the harsh realities of a world in which nuclear weapons exist and cannot be disinvented. Words and dreams cannot by themselves justify what the Prime Minister described to the United Nations as the perilous pretence that a better system than nuclear deterrence is within reach at the present time.

Thirdly, any deployments of space-based or other defences must be a matter for negotiation. The Prime Minister agreed this with President Reagan at Camp David, and they reaffirmed it in Washington. In the words of the White House statement of 3 January, deployments of defensive systems would most usefully be done in the context of a cooperative, equitable and verifiable arms control environment. A unilateral Soviet deployment of such defences . . . would destroy the foundation on which deterrence has rested for twenty years. I warmly welcome the clear statements of the U.S. administrations view that deployments would need to be a cooperative endeavour, to be embarked upon in an arms control context.

There is a fourth factor: the linkage between offensive and defensive systems. The White House statement of 3 January recognised the merit in controlling both the offensive and defensive developments and deployments on both sides. If defensive systems are to be deployed, they will be directed against the then levels of offensive forces. If the latter can be lowered dramatically, then the case for active defences many be correspondingly strengthened. Conversely, radical cuts in offensive missiles might make the need for active defences superfluous. Equally, the effectiveness of defences will be directly governed by the numbers of missiles and warheads which they are intended to destroy. If the levels rise dramatically, then the effectiveness of defences may not be adequate.

It is therefore clear that there is and will continue to be an integral relationship between measures to control offensive forces and any decisions to move to the development of active defences. The U.S. administration have always recognised such a linkage. Belatedly, the Russians now seem to have reached the same conclusion. As the new negotiations, finally launched this week, get underway, a key question for all our futures will be the extent to which reductions in offensive forces prove possible and the impact this will have upon the incentive to develop defences.

We warmly welcome the renewal of U.S./Soviet talks. The joint communique agreed between them as the basis for the talks describes their aim as the prevention of an arms race in space and its termination on earth. We applaud and endorse that aim. There is no doubt however that progress will be painstaking and slow. We cannot expect sudden breakthroughs. In the words of Tolstoys General Kutuzov, patience and time will have to be our watch words. There is no quick or easy route to success.

Progress will be that more difficult if we fail to establish a new basis for confidence and trust between the nations of East and West. This political process provides the framework within which arms control negotiations take place. If political relations are bad and mutual trust and confidence low, the possibility of making progress on arms control is reduced. All arms control agreements are based on a mixture of technical and political judgements. A broader range of contacts and a deeper understanding of either sides real concerns are an essential element in the process.

Mr. Gorbachevs recent visit to London, the prime ministers talks in Moscow with him earlier this week, my meetings with Mr. Gromyko in 1984 and, I hope, later this year, represent part of our own contribution. We intend to continue this. In our contacts we have been frank about Soviet policies which cause us concern. But we have also made clear our understanding of Soviet security interests and concerns. We know that historical experience has inclined them towards over-insurance. But complete protection is not available to any country. The best that can be hoped for is a balance of capability matched by mutual confidence about intentions, together, they should create greater stability and thus security. We are prepared to make consistent and sincere efforts on both counts. I trust that the Soviet leadership will be prepared to do the same.

At the same time our efforts must not slacken in maintaining the cohesion of the alliance. The debate over the deployment of cruise missiles in Europe proved one thing at least. Alliance unity can not only enhance our security. It can provide a new incentive to our adversaries to meet us around the negotiating table. Geneva has shown that the Russians have realized when the self-imposed policy of isolation was self-defeating.

But allied cohesion must be sustained. We will need to continue the process of close consultation we have always enjoyed within NATO, and in bilateral meetings with our allies, of which the prime ministers recent talks were an outstanding example. I know how much importance our American friends attach to this process. It will be all the more important in the face of the concerted campaign we must expect from Moscow in the months to come.

The Soviet leaders claim to be in earnest about arms control. The whole world must hope they are. But of one thing we can be certain. If they feel confident that they can attain their objectives without making the concessions necessary in any negotiations, they will not hesitate to use all the propaganda at their undoubted disposal. The more they are tempted to pursue their aims outside the negotiating room, the less serious they will be at the table. And if they can in the process split the alliance, even if this means forfeiting an agreement, they may be tempted to rate this a greater prize. They tried on INF. And they failed. We can be sure they will try again. United as we have been so often in the past, the West must stand together. We cannot afford to fall divided.

The Western democracies face a new challenge, and an historic opportunity. The prize is a more stable peace in this troubled world. The arms control process has

been relaunced in Geneva. We now have a fresh chance to demonstrate that arms control can enhance stability and increase our security. We must approach the task with due deliberation, retaining as our basic objective deterrence of aggression as the best defence against potential attack. But we must approach it too with real energy and determination. The chance is one we must take great care not to miss.

Dr. SCHLESINGER. Sir Geoffrey Howe, the British Foreign Secretary, has taken note, as it were, of the problems involved.

We have, of course, emphasized in the West that we have appealed internationally for support of the full Strategic Defense Initiative, that we have all of our allies on our side. They are on our side, but with hesitation, as reflected, I think, in Sir Geoffrey's statement.

He underscores the need to preserve the deterrent, not to do anything that undermines the deterrent, that the whole goal of any research in this area should be strengthening of deterrence, and he finally, I think, points out that the British Government has been given a commitment by the United States, or by the President of the United States that there will be no deployment of these capabilities without prior negotiations.

So I underscore that to get out in front of our allies will create diplomatic problems and will run against the grain of what we should be doing, which is to preserve the deterrent and the confidence of our publics in the deterrent.

Finally, Mr. Chairman, on this point, it is not necessary, for those who are advocates in the administration of the Strategic Defense Initiative to indulge in this kind of inflated prose. It is not necessary for them to attack what we are presently doing. In many areas, Mr. Chairman, we have been attempting to reduce the risks and the attractiveness to the opponent of an initial move against our forces or against our allies, and we add to that at the same time that we discourage such attacks through defense. We say that, if necessary, we will retaliate with nuclear weapons. We continue to rely on nuclear deterrence for NATO defense as well as defense of the North American Continent, and see no inconsistency between the pursuit of defense and the maintenance of deterrence.

It seems to me ill advised for the administration to continue to press the argument that deterrence is immoral.

Now, Mr. Chairman, I would not have pursued this at this length this morning because I had hoped that the administration had begun to back away from the statement that deterrence is immoral. But I noticed that in last week's interview with Newsweek magazine the President himself made such a statement once again.

So I think that it is necessary for us to straighten out this issue: Till the end of our children's lifetimes our security and the security of the Western World will continue to depend upon deterrence and that it is harmful to us to attack it.

Mr. Chairman, I want to close on the following note. There is an implicit contradiction between the version of strategic defense that has been advocated by those who might be called the visionaries and those who are the revisionists.

The visionaries hold out the hope, as the President has said, that at some future time nuclear weapons will have been rendered impotent and obsolete. They have suggested that we will be able to place over the North American Continent, at least, a defense that is impermeable.

At the same time that this vision has been held up—and it is this vision, I think, that provides the political force behind the public support for the current version of SDI—there is the revisionist approach. The revisionist approach has taken the President's original proposals and said we cannot do this layered defense at this time but we can have terminal defense, terminal defense that I indicated earlier we should, indeed, reexamine because of the changes since 1972. But terminal defense will not achieve what the President has talked about. The President has said that what we are trying to do is to protect people and not weapons, and terminal defense will protect weapons and not people. It may or may not prove to be a good adjustment to make after careful examination.

But it is quite different from the earlier version.

TERMINAL DEFENSE

Moreover, Mr. Chairman, the purpose of terminal defense is to strengthen deterrence. It is to protect our strategic retaliatory forces. It is to strengthen deterrence. And, under those circumstances, if the way we are going with strategic defense ultimately is only to deploy terminal defense, which is something we can do, then we ought not to be indulging in this rhetoric that undermines public support for deterrence, which will continue to be based upon our nuclear forces.

Mr. Chairman, there are two tiers, there are two kinds of capabilities that we have stressed from the first: The capability to deny to an opponent the confidence that an initial attack will be successful; and the capability if the opponent is not deterred by that that we will retaliate with larger forces.

These are not antithetical concepts.

It is important, it seems to me, that they not be made antithetical in the context of our discussions of the Strategic Defense Initiative. To a greater or lesser extent we will continue to require both in our defense forces. And to create some false antithesis between this capacity to reduce the confidence of an opponent's belief in a successful attack and deterrence strikes me as dangerous.

Mr. Chairman, I think this subcommittee, the Armed Services Committee, the Senate, and the Congress of the United States have an opportunity to reduce some of the rhetoric that has flown about this issue and to bring a sense of proportion back to the discussions about our defense posture.

Thank you.

SDI AND PROMPT RESPONSE PRESSURES

Senator WARNER. Thank you very much, Dr. Schlesinger. I personally have found your comments very refreshing.

The subcommittee has been through many hours of testimony here and our only regret is that we did not have you as the leadoff witness. Perhaps you could have set a course that would have saved us a little time.

I have two questions.

The first question is directed toward your interpretation of strategic policy and particularly the circumstances under which the President of the United States, together with his advisors, would

contemplate using in a defensive manner, a retaliatory measure, any element of our nuclear forces?

There is a view held by some—and indeed I find it quite troubling—that through the advancement of technology on both sides, that is, the Soviets and the United States, we see ourselves moving more and more toward the necessity in the face of an attack for a more prompt response.

Do you find that to be the case? If so, couldn't you view the SDI as a step toward lessening that situation?

Dr. SCHLESINGER. I believe, Mr. Chairman, that you have put your finger on one of the most difficult aspects of discussions of nuclear strategy.

On the one hand, we should recognize the difficulties embodied in a prompt response, in a response that is within minutes, as it were, of a hypothetical large-scale launch by the Soviet Union in the case of the SDI, or, alternatively, 25 minutes, 20–25 minutes in the case that we are looking at the terminal phases of the trajectory of a Soviet ICBM.

That is very time-compressed and I will come back to it in a moment. But that is one aspect.

The other aspect, Mr. Chairman, is that the Soviets must never be reassured that we will not respond immediately. They should not be given that degree of confidence. There should always be a degree of uncertainty associated in the minds of Soviet leaders with how the United Stated would respond under certain hypothetical conditions.

LAUNCH UNDER ATTACK

There has been discussion I believe before this forum of the so-called launch under attack. I think that that is a very difficult subject for us to discuss, but the point I want to discuss at the moment is that we should not in advance give the Soviets confidence that we would not act in that way.

Coming back to the issues of time pressures, it is very hard to react promptly, even in the half-hour of warning time that we presently have. So, if one is looking at the SDI system, which is up there in space, one has to react instantly. In fact, one has to have, I believe, automation so that one is going to remove this process from the political decisionmaking by our senior leaders, so that it will have that kind of response.

You will have to inform the Soviet leaders ultimately of that fact.

Moreover, if the United States were to attempt to respond immediately, it would have some 5 minutes to find the President of the United States, make a political decision, get it back to the appropriate command point and to alert our capabilities in space to respond. Five minutes is very brief time if one is not engaged in automation, and even in that period there will be a great worry about false signals, false signals which we have had in the past.

So I think there is no alternative under those circumstances but to automate the system. This would raise some question if one were dealing with a kill mechanism that included nuclear weapons. It would involve less questioning if one were using other devices.

I am not sure, Mr. Chairman, whether I have dealt with the issues that you had in mind when you raised that question.

Senator WARNER. Essentially, the question was whether or not SDI helps to ease this move toward a more rapid response.

Dr. SCHLESINGER. I do not think there is any reason to believe that. It is a question of defining what one means by "rapid response."

What one would be doing, I think, under the circumstances, is to have an automated defense capability in space, that would substitute, if the kill mechanism is nonnuclear, for a Presidential decision to go nuclear. It would alleviate, I think, in certain respects the problems, because neither the territory of the United States nor the territory of the Soviet Union needs to be attacked under those hypothetical circumstances and, therefore, clashes of weapon systems in space may be less catastrophic in terms of the political relationship than would be the case of U.S. RV's impacting on Soviet soil or theirs impacting on our soil.

But, no, it does not alleviate the time pressure. Indeed, it transforms the problem of time pressure by simply automating a U.S. response which we pretend under those circumstances alleviates the necessities of responding quickly.

ABM TREATY AND THE KRASNOYARSK RADAR

Senator WARNER. Thank you.

I have a second question.

You served as Secretary of Defense shortly after the ABM Treaty came into being, and now we are faced with what appears to be really a blatant, carefully planned violation by the Soviets with their Krasnoyarsk radar system.

How would you advise the President today were you Secretary of Defense to respond to that situation?

Dr. SCHLESINGER. I don't think the Soviets have given an adequate answer with regard to the ABM radar, or apparent ABM radar, I should say, and that they must be firmly pressed in the diplomatic process to give an appropriate answer.

The Soviets have said that once we see that radar in operation, we will realize that it is for space trace purposes and is not for ABM purposes.

They have shaved, they have at best shaved very close to the fine print of the ABM Treaty, and even if this is not intended for ABM purposes, they have probably strayed across the line. They have strayed across the line because this kind of radar was not supposed to be placed elsewhere than on the periphery. To define the periphery as extending 500 miles inside the Soviet Union is to play with the words.

Senator WARNER. Thank you.

Mr. Hart?

SDI FUNDING

Senator HART. Dr. Schlesinger, the President's research program, as you know, contemplates $26 billion in expenditures over 5 years, starting with just under $4 billion in 1986, and going up to close to $9 billion by 1989 or 1990.

Given your remarks here this morning, what do you think is a more realistic level of funding, and in what range?

Dr. SCHLESINGER. That, Senator, is, of course, a difficult question. I think that the Members of the Senate should be satisfied that the funding that is provided is based upon programs that are substantively sound, and that the funding that is provided—I say this with all delicacy—is not used as a "slush fund" to advance or propagandize for the system.

There seems to me to be some danger in that.

Let me point out in the first place that the fiscal year 1985 request, the fiscal year 1985 figure, was $1.4 billion. The request for fiscal year 1986 is $3.8 billion. That is an increase of 150 percent.

It occurs to me, as an old time budgeteer, that there may be a certain amount of "cut insurance" in that request. Indeed, I think there is probably some substantial cut insurance in there.

I offer that as an initial comment because I think the administration expects to see some reduction, and it is prepared to deal with that by requesting a generous amount at the outset.

The second point is that I have seen few research programs that can profitably expand at a rate in excess of 30 or 35 percent—few research programs.

If ones tries to expand much more rapidly than that, one is reaching out to the fringes to find out all sorts of groups that offer some hope or promise or at least the semblance of a promise that they may contribute usefully to the program.

Now, I may be on the conservative side and others may say that you can expand 40 or 45 percent effectively. But it is somewhere in that range that I think that funds would effectively be used.

I believe if the subcommittee examines the intra-administration disputes about the request for this year, it will find that there is a substantial body of opinion that the request should be such that one wound up with a 30 or 35 percent real increase after the congressional deliberative processes.

If that is the case, one is looking at perhaps $2 billion in funding, perhaps less, and reductions in the funding request of close to $2 billion.

Senator HART. I think it is the first part of your formulation that is most troublesome in that you say the Congress has to take a hard look at these programs. These are among the most exotic technological programs I think any of us has faced in a barrage of technological programs in 10 years. It is awfully hard for laypersons to figure out what is and what is not a reasonable program. That is why I think it is so important for experts outside this system to help us define reasonable boundaries as we go along year by year.

COMMENTS ON SPEECH BY AMBASSADOR NITZE

Are you acquainted with Ambassador Nitze's speech of about 2 weeks ago in Philadelphia, in which he laid down certain criteria for transitioning from the assured destruction to the defensive stage? The two most important, as I recall, were that the technology works with a high degree of reliability and, second, that all ele-

ments of the system be cost effective on the margin, less expensive to build than to overcome.

Do you have any responses, briefly, to that speech?

Dr. SCHLESINGER. I welcome Ambasssador Nitze's comment. I should say that I welcome the speech overall. There are two parts of the speech: one in which he establishes certain criteria that must be satisfied before we deploy any space-based defense. Those criteria are two: one, that there be sufficient invulnerability in that space system so that one's opponent is not given an inducement to preempt; the second, as you indicate, is the cost-effectiveness of that program.

If, as we have always thought in the past, the defensive capabilities will cost more to knock down enemy ballistic missiles than it costs him to add to his array of ballistic missiles, then it is an ill-advised investment on our part. Now I am not talking about terminal defense, once again. I am talking about the space defense.

Ambassador Nitze said very firmly, and I hope that he was speaking for the administration overall, that we will not in any circumstances deploy such a space based system unless it meets these two rigorous criteria.

If, indeed that is administration policy, it should go a long way to calm the critics of this system.

So part of the speech I thought was a breath of fresh air in this atmosphere that has grown redolent with rhetoric.

In the other part of the speech, Ambassador Nitze attempts to lay out three stages through which the strategic relationship between the United States and the Soviet Union would go.

I think it was an ingenious attempt by Ambassador Nitze who has done his best to provide the administration with a strategic concept in this area. But, despite its ingenuity, it is substantively unsatisfactory.

It is unsatisfactory because it is more of a strategic cover story, as it were, than it is a strategic concept.

Why is this?

The first phase that Ambassador Nitze described is a phase in which both sides substantially reduce the number of nuclear weapons, or ballistic missiles, presumably with some reduction in bomber forces as well.

We have been that route several times, as you know, Senator. We have tried that in 1981. We have tried that in a different guise, in 1977, when President Carter started down this trail. There is very little inducement to the Soviet Union under the best of circumstances to reduce their ballistic missile forces simply to offer comfort to the United States. The Soviets have never been that charitable, and those who cry most clearly and loudly for the Soviets to exhibit this form of charity are the ones who have the deepest suspicion of Soviet motives. There is some question in that regard.

But, in addition, when one looks at the second phase and the third phase, one knows that the incentive that one is providing to the Soviet Union for the first phase is not to reduce offensive capabilities, not to reduce throw-weight, but to expand offensive forces and to preserve and extend whatever throw-weight advantages they have.

So the introduction of a hypothetical defense down the road vitiates the first phase.

Moreover, as one looks to the second phase in which defenses are supposed to supplement offenses in some well balanced system, leading ultimately to mutual assured survival, one does not have the definition of mutual assured survival, and one does not see the incentives that would exist in that second system.

Indeed, we have been making in the course of recent months various commitments. The President has committed himself to sharing this technology with the Soviet Union at some future date. The Soviets I think remain somewhat skeptical whether this President would provide that technology. But, in any event, he will not have the technology to provide, and they do not feel that a successor is likely to be bound by any commitments made in 1984, and that public opinion is perhaps not likely to look with favor upon providing to the Soviets technologies that we have spent $50 or $100 billion at least to develop. We have also promised to our allies that we will never deploy these systems without prior negotiations with the Soviets.

So we are in an embarrassing position as to how, even if you get past the first phase, to deal with the second phase.

I think I have said enough, Senator.

On the one hand, Mr. Nitze's criteria, if they are followed by the administration, are most welcome. They are a breath of fresh air. On the other hand, the strategic concept, so called, just does not add up substantively.

Senator HART. My time is up. I would just like to come full circle back to the research phase and say that I have heard, although I do not think, Mr. Chairman, we have documented it in this subcommittee, that pieces of this research are going out to as many as 20 of the largest defense contractors in America, and commitments have been made if not formally, then informally, by high level people in the administration that contracts would be let to British and French and who knows how many other allied nations. It seems to me that we are seeing the classic creation of a political and economic constituency for not only one program but a vast array of programs which, once unleashed, would be virtually impossible to shut down.

Senator EXON. How does that differ from the MX? Isn't it the same thing?

Senator HART. It's much bigger.

Dr. SCHLESINGER. Well, I don't know whether I should say that I share your suspicions, Senator, but I will reminisce a bit about the B-70 Program, in which we managed to have contracts out in every one of the 50 States. That required some scraping, to get all 50 in. But we had built a constituency for the B-70 that was formidable. The B-70 was turned off by Dwight Eisenhower against what was very formidable opposition.

I believe, if I recall correctly, he had to have a veto sustained up here on the Hill. I would point out that Dwight Eisenhower had a degree of credibility and degree of support on the part of the American public that have been matched by few presidents.

So while it is not impossible, once one has built in this kind of constituency, to see the demise of a program, it requires good luck,

great political skill, and a president with the political prestige of Dwight Eisenhower. I don't know whether those are formidable criteria either.

Senator WARNER. Would the Senator from Georgia indulge the Chair for one observation?

Senator NUNN. Sure.

Senator WARNER. I am inclined to believe, Dr. Schlesinger, as one who will be responsible on the floor for the SDI program, that I will hear this statement about a 33⅓ percent growth being realistic several times. The question I pose is this. Have you had the opportunity to really examine the basis for this rather substantial incremental growth request? Indeed, it is over 100 percent? If not, would you be willing to avail yourself of a special briefing, which I would be happy to arrange if that is necessary——

Dr. SCHLESINGER. I would be happy to do that, Senator.

Senator WARNER [continuing]. And then, following that to revise or supplement your remarks in the record as appropriate.

Dr. SCHLESINGER. Yes, of course.

Senator WARNER. I thank you.

Senator NUNN. Or perhaps, reiterate them if appropriate, Mr. Chairman.

Senator LEVIN. You mean revise them upward or downward, gentlemen. [General laughter.]

Senator NUNN. I think that is a very good suggestion, Mr. Chairman. I think it would be extremely valuable for this subcommittee to have Dr. Schlesinger take a look at the details of this budget. We keep hearing that those who are responsible should take a look at the details, and yet this is a highly intricate technical area. I think it would be enormously helpful, as Senator Hart pointed out to you, Mr. Chairman, for him to move in that direction.

Senator WARNER. Fine.

We received yesterday and unfortunately—and I take responsibility—many Members were not able to be present, a briefing in which Senator Exon and I and General Abrahamson went through the basis for this very substantial incremental growth. I join with Senator Hart that it is very difficult for those of us who are not specifically trained in this area to make an evaluation.

I think your judgment will be of great value. Would you undertake that special assignment?

Dr. SCHLESINGER. I would be happy to, Mr. Chairman, if that should be a general wish. If it is not the wish of the administration, it would not be appropriate, however.

Senator WARNER. I beg your pardon?

Dr. SCHLESINGER. If it is not the wish of the administration, it would not be appropriate.

Senator WARNER. It is the wish of the Congress, that is, the Senate, and we will make arrangements to see that you are given full access to this information.

Dr. SCHLESINGER. Mr. Chairman, may I make one additional statement in this area?

Senator WARNER. Yes.

Dr. SCHLESINGER. I think, for the reasons of the change in the strategic environment since 1972, there are those who say that we

should cut off research, that the research itself is dangerous, and so forth. You know the argument.

I have not subscribed to that view. But I would point out in connection with your observation that it is most important for those who are advocates of strategic defense to have a prudently paced program. If that program expands too rapidly, it will become a laughing stock.

I have heard of incidents, which I am not going to repeat, of various so-called defense intellectuals being offered extended tours to survey opinion in allied countries and the like. This is very tempting—to buy support, as it were, of the community of defense intellectuals in this manner. I think if this is done, it would be bad for the program, it would be bad for the country, it would be bad for the Pentagon. I think every effort should be made to keep this a prudently paced program.

Senator WARNER. Thank you.

And thank you, Mr. Nunn, for being patient.

Senator NUNN. Mr. Chairman, at this point Secretary Schlesinger has done such a marvelous job of pointing out some of dangers of the philosophical argument where some of our opinion on the right seems to be meeting some of our previous opinion on the left in terms of the immorality of the policy we will have to rely on in the foreseeable future in terms of deterrence.

I would like to insert into the record an article by Christoph Bertram on this point which appeared recently on the op-ed page of the Washington Post. It gets into that same argument.

Senator WARNER. Without obligation, it is so ordered.

[The referred to article follows:]

[From the Washington Post, March 17, 1984]

STRATEGIC ESCAPISM

(By Christoph Bertram)

A European who remembers the heated and bitter debate over whether U.S. Pershing and cruise missiles should be deployed must ask for understanding if he finds it difficult to follow the present American advocacy for strategic-missile defense.

In the European debate, anti-nuclear protestors, the political left and many men of the church were all claiming that deterrence was no longer acceptable as the basis for Western security. It was, they said, profoundly amoral to threaten the destruction of another society. As we know, their protest did not succeed. But now no less a person than the president of the United States is saying virtually the same:

"The human spirit must be capable of rising above"—March 1983.

"Would it not be far more humanitarian to say that now we can defend against a nuclear war by destroying missiles instead of slaughtering millions of people?"—October 1984.

"There is a better way of eliminating the threat of nuclear war than retaliation with a deadly counterstrike"—February 1985.

What makes these remarks so disturbing is not that they may or may not be correct sometime in the 21st century but the effect they have today, in the 1980s and 1990s. At this stage, nobody knows if there ever can be, from a technical point of view, a reliable defense against ballistic missiles; most scientists doubt it. Nobdy knows all the countermeasures that a determined enemy might develop. And nobody knows whether such a system could ever be funded—the price tags currently quoted of around $500 billion are as speculative as the rest of the exercise.

On this shaky basis, caution rather than enthusiastic advocacy would seem the order of the day. One would expect a serious research effort to identify what is possible in defensive systems, coupled with persistent emphasis that, for the foreseeable future, there is no alternative to the "balance of terror" as the underpinning of our security. Yet we are witnessing something very different. From the highest author-

ity of the Western World comes a string of statements that the dreadful, morally repugnant days of deterrence through the threat of retaliation are numbered and the bright, new and morally sound alternative of strategic defense is nigh.

If deterrence were a robust doctrine with strong public support, one could dismiss these statements as the typical American way of presenting visions as if they were reality. But deterrence is far from enjoying popular support. It has taken a serious knocking in recent years. Skepticism, doubts and outright rejection have grown in all Western societies. There are many reasons for this. The spectacle of an unrestrained arms race has raised fears where all this might end. The deadlock in East-West arms control has disappointed many hopes. Military men and civilian strategists have pretended that somehow the waging of nuclear war could become a serious military option. The peace movements have frightened themselves and others that deterrence is driving the world to certain disaster.

The net result is that deterrence through the threat of nuclear retaliation has become a brittle concept—not vis-a×2-vis our adversaries but in the eyes of our own citizens. And yet, to date, it remains the only concept we have for survival in the nuclear age. It has helped to keep the peace between East and West for 40 years and, unless political leaders should lose all caution, is likely to continue to do so. To fight a nuclear war may well be immoral. But to threaten nuclear retaliation in order to prevent an attack is a very different matter.

Moreover, we may have no choice. If past experience is any guide, the attempt to escape from the nuclear dilemma through strategic defense will end up like all other attempts in history that sought to replace offense by defense: with a new arms race and, despite major efforts, no basic change.

If the Strategic Defense Initiative should escape this fact, it would be little short of miraculous, something to believe when it happens but not to bank on now. The difference between those in favor and those against SDI is whether, in some distant future, defenses against ballistic missiles could effectively constrain a determined enemy attack. That remains to be seen. In the meantime, as Paul Nitze, special advisor on arms control to the president and the secretary of state, has noted, for "at least the next 10 years, we will continue to base deterrence on the ultimate threat of nuclear retaliation. We have little choice; today's technology provides no alternative."

However, the constant attempts from the White House to talk strategic defenses up by talking retaliation down will make it increasingly difficult to regenerate and maintain public support for the West's nuclear doctrine. And what if, at the end of all the research, a stategic defense, the bright new world, fails to materialize and we arrive where we started—in the old, grey world of deterrence?

The enthusiasm for SDI is thus an example of the familiar human failing of constructing the future before mastering the present. Unless solid research results allow for a proper examination, it is an example of strategic escapism. There is, for a long time to come, no alternative to keeping the peace by threatening an enemy with nuclear destruction. Political leaders, instead of straining further an already brittle consensus in our societies, should seek to strengthen it through realism and not weaken it through illusions. In the nuclear age, you play around with deterrence at your peril.

DETERRENCE CONCEPTS AND OPTIONS

Senator NUNN. Dr. Schlesinger, the question of deterrence, assured destruction, Mutual Assured Destruction, we hear all of these terms. Just for clarification, I believe the term you used was that we would rely on deterrence for the foreseeable future.

Would you define generally for us what you mean by deterrence if that is distinguished from what we know as assured destruction. Could you tell us the difference between those two concepts.

Dr. SCHLESINGER. Yes, sir, Senator.

I think, once again, this is a very important question that has become obscured by the rhetoric of late.

Secretary McNamara, if I may go back to history, developed a concept of Mututal Assured Destruction. That was based upon the measurement of the fatalities that we could inflict on the Soviet

Union or factory floor space that we could destroy in the Soviet Union—it was not clear—and that was his measure of deterrence.

But we have a come a long way from that concept of deterrence, based upon Mutual Assured Destruction. That concept has evolved over the years. It evolved as a result in part of our decisions in 1973-1974, which Senator Warner will recall from an earlier phase, of moving to a concept of selective strikes, of strikes that we would not define in advance, to deter a Soviet assault against Western Europe.

The point is that we moved away from the original concept of Mutual Assured Destruction, which was based upon a prior concept of massive retaliation, to a greater degree of selectivity. As a result, Senator, today deterrence depends upon an array of capabilities and the United States and her allies are prepared to move up that scale. We reserve Mutual Assured Destruction solely for the deterrence of Soviet attacks against our own cities. We have pledged over the years to avoid Soviet cities in the quest that the Soviets avoid our cities.

Now this is all history.

Some of the supporters of SDI would like to revive Secretary McNamara's version of Mutual Assured Destruction, and that is where we get into these arguments about morality. But that is overtaken by events. That is water over the dam.

We have a much more sophisticated concept of deterrence and Sir Geoffrey Howe in the speech that he gave last week observes that they refer to this as MAD, meaning Mutual Assured Destruction, but I prefer to think of this as Mutual Assured Deterrence. And we have the various gradations.

I myself do not think the Soviets or we would be prepared for a massive strike against the cities of the other side as long as political control exists over the process.

Senator NUNN. Thank you very much.

I think that is an enormously important concept.

Mr. Chairman, I happen to believe that the testimony we have received from Dr. Schlesinger on this point probably is the single most important testimony we have had not only on this subject but on any subject this year. We are moving very rapidly into never-never land in this philosophical debate. It is being treated philosophically now. The media has paid very little attention to these words. They have all focused on the concept of Star Wars. But what we are talking about is the President of the United States and many of his top advisors basically disparaging a concept which we live under now and which we are going to have to live under for, in the words of Paul Nitze, for the "foreseeable future," and in the words of Dr. Schlesinger, for the lifetime of our children, perhaps even longer.

I don't want to slip up on you with a quote here. I want to be absolutely on the table with it. But this is a speech delivered by Robert McFarlane to the Overseas Writers' Association on March 7, 1985.

Let me quote in light of the recent statement you made from that speech. It appears to be on page 7.

I quote: "The second point involves saving lives. Very bluntly, we can deter an attack by defeating that attack or by threatening to kill enemy civilians in retaliation."

How does that fit into your definition of either Mutual Assured Destruction or the broader concept which you now describe as being our policy of deterrence?

Dr. SCHLESINGER. Well, I think that Mr. McFarlane has narrowed the options open to the United States. What he implied there was that the only alternative to being able to stop a Soviet nuclear attack is for us to be prepared to destroy Soviet cities.

I regard that as a false set of options. It is false in the first place because we are never going to be able to stop a Soviet attack. Even most of the supporters of the SDI Program do not believe that.

There is no way, for example, even if one had that astrodome over the United States, that one could prevent the penetration of American air space by air breathing vehicles.

The Soviet response to what we are hypothesizing would be to set up 60 or 80 submarines off the east coast and 60 or 80 off the west coast. They would be there all the time with cruise missiles at the ready. And they could penetrate and they could attack our communications centers. So this system could be easily countermeasured.

So, I don't think that the one proposal that we could defend in the sense of stopping those incoming objects is a real world option, and I don't mean in 1985, but I mean in 2020.

Now, with regard to the other point, we have much broader options than attacking Soviet civilians. The administration knows full well that it is now some 13 years, no, 12 years, since we changed our strategic objectives. We have introduced limited nuclear options, regional nuclear options. We are prepared to deal in a variety of steps with a Soviet assault that overwhelms our conventional capabilities in Europe.

STRATEGIC DEFENSE AND THE MX

Senator NUNN. May I interrupt you right there to ask this question?

Dr. SCHLESINGER. Yes, sir.

Senator NUNN. If Mr. McFarlane's thesis is correct, would that not be reason to vote against the MX? The question here is why do we need an MX with highly accurate targeting if, according to the National Security Advisor, our only choice is to kill civilians?

We have plenty of weapons out there now that can kill civilians, do we not?

Dr. SCHLESINGER. Well, as you know, Senator, I am a supporter of the MX.

Senator NUNN. I am, too, but increasingly reluctantly, and with a great and growing skepticism.

Dr. SCHLESINGER. But I must follow the logic of your question.

I am a supporter of the MX because I do not believe that we are going to have these airtight strategic defense capabilities. If I believed it, as you say, then the argument for offensive forces becomes weaker—if one really believes what is being said. But one should add this note: if the Soviet Union deploys a strategic defense, our hypothetical way of countering that strategic defense

will be vastly to expand our own offensive forces, which means enhancing greatly our throwweight beyond that which is carried in the Minuteman missile.

Senator NUNN. With penetration aids and all of that?

Dr. SCHLESINGER. Yes, pen-aids and so forth.

Now this was delicately alluded to—I hope delicately alluded to—by the Scowcroft Commission. The argument for large throwweight missiles is enhanced if your opponent creates a defense.

THE ROLE OF MAD

Senator NUNN. I have one other question.

This is a quote from the President's Inaugural Address: "Is there either logic or morality in believing that if one side threatens to kill tens of millions of our people, our only recourse is to threaten killing tens of millions of theirs?"

I realize that is rather ambiguous in terms of the way it is hypothesized, but would that also tend to describe our position now as one of Mutual Assured Destruction as the only option?

Dr. SCHLESINGER. It does in this respect, Senator. It is not the whole of our deterrence. It is the form, that aspect of deterrence, that protects our cities. To the President's rhetorical question I would answer yes, there is logic in so threatening, and yes, there is morality in so threatening, because it is that way that we protect our cities and protect the Free World.

Senator NUNN. Thank you.

May I ask one other question, Mr. Chairman? My time is up.

Senator WARNER. Yes, go ahead.

Senator NUNN. In this same speech, earlier in the speech, Robert McFarlane said, and I quote: "Those who disagree with us and who continue to support the discredited policy of assured destruction must face the following fact." That is the end of the quote.

It seems to me, Dr. Schlesinger, that what you are basically saying is, in order to sell SDI, they basically have described our present position as only a position of retaliating against civilians, which, basically, is to take in 1985 the McNamara Mutual Assured Destruction theory and pose it in 1985 in order to sell a new program. Isn't that about what it amounts to?

Dr. SCHLESINGER. That is about what it amounts to.

I should point out that Mr. McFarlane, at the time we made these alterations during the Nixon administration in our targeting strategy, was in the White House, and he knows full well, I think, that our strategy is not to attack Soviet cities in response to a Soviet assault that is less than an all-out assault against the urban centers of the West.

I think it is important that we get away from this rhetoric that has crept in which is undermining us, will ultimately undermine support for that on which the defense of the West must continue to rest.

Senator NUNN. What you are saying is, in order to sell a program the research of which you support on a reasonable and prudent basis, they basically have so distorted our present deterrence philosophy that we are undermining the very kind of policy we must continue to rely on for a long time to come.

Dr. SCHLESINGER. It is more complex than that, Senator. You have accurately described half of the defense of this program by those who are close to the President, a relatively small number of people who share his vision of the astrodome and believe that that vision can be transformed into an all-out protection of the North American continent, including the air breathing threat.

But there are also others who support strategic defense, people in the Pentagon, many who have worked for years on terminal defense, many who have had reservations over the years about the ABM Treaty. They, essentially, are picking up the lead and saying let's do what we can do now, let's start to deploy a system.

They know that we cannot deploy a space system, but they know that we can deploy a terminal defense. That concept is inconsistent with the goals of the vision and it is inconsistent with the rhetoric that you have. So there is an inconsistency in the advocacy of strategic defense.

I think I should point out, since I did not point out in my earlier remarks, that while I believe we should review the ABM decisions of 1972, we should review them meticulously and with great discipline; because there is now a predilection, some of which Senator Hart referred to, to begin to deploy now that system which is terminal defense. This may make sense and it may not make sense. It should be examined in and of itself and not on some presumption that that initial deployment is a transition step to the astrodome concept.

That is a poor reason for deploying it.

Senator NUNN. It should be judged on its own merit?

Dr. SCHLESINGER. Yes, sir.

Senator NUNN. Thank you, Mr. Chairman.

Dr. SCHLESINGER. And it should be judged on its own merits primarily in terms of what it does to the political relationship between ourselves and the Soviet Union and the political relationship between ourselves and our allies.

We have now gotten to the point where we are eager to do something to justify the fact that we can do something. It is in those circumstances that one is likely to do something reckless.

Senator NUNN. Thank you.

Thank you, Mr. Chairman.

Senator WARNER. Mr. Exon?

Senator EXON. Thank you, Mr. Chairman.

Dr. Schlesinger, welcome. We are always delighted to have you come before the subcommittee.

SDI AS A BARGAINING CHIP

We have spent a great deal of time on SDI in this subcommittee, and I am delighted at the suggestion of the chairman that you take a look at some of the reasonings that we have heard.

Frankly, as a professional skeptic of the military, I happen to feel that some of the things that they have said about SDI are somewhat overblown. I agree the rhetoric has gone beyond all due bounds. But I think at least they are on to something here from the standpoint of a bargaining chip, if nothing else.

Is it fair to summarize your feeling on SDI in the following way: while you feel it has been overblown, we should spend some additional amount of money for research, and research only? And if that is your true feeling, do you also believe, as I do, that the Soviets are concerned about this for a variety of reasons and that SDI might, indeed, be a useful bargaining chip to move them toward true arms reduction?

That is what I read into your testimony. Is that generally the overall picture?

Dr. SCHLESINGER. Yes, sir.

If I may, I will make a few comments on that, or will save them until later, as you prefer.

Senator EXON. No. Go right ahead.

Dr. SCHLESINGER. In the first place, the military is immensely good at what it is good at, and one should not be skeptical about the military. The military establishment has been told by its commander in chief to go out and research in this area. And when the commander in chief says that, they turn to.

I do not believe that any disagreements about the ultimate wisdom of this program should in any way be attributed to the military establishment because they turn to.

One should not be skeptical about that quality of the military. But about the political judgments, that is somebody else's responsibility.

Second, I believe that this should be a research program, but that it need not always remain a research program. It could lead to deployment. But the deployment issue should be consciously and separately faced. We should not just drift into deployment because somebody wants to do something.

I might say in that connection that there are many people who want to anchor us in now to a commitment to deployment in a way that is wholly premature. They have stated quite bluntly that they want this to occur while Ronald Reagan is President of the United States so that some future President cannot unhook us from that commitment.

Third, I have long advocated the bargaining chip concept of SDI. It is an ideal system. Indeed, it is the quintessential bargaining chip. It has brought the Soviets back to the table in Geneva.

I have advocated and I will introduce some remarks that I made at the Mitre Corp. into the record, Mr. Chairman, if I may.

Senator WARNER. Without objection.

[Remarks by Dr. Schlesinger at the Mitre Corp. follows:]

REMARKS AT MITRE CORP. BY DR. JAMES R. SCHLESINGER

During the mid-1960s when I was at RAND, the initial deployment of the Soviet ABM system caused a good deal of concern. The perplexing question of how to assure penetration of that system was argued and re-argued. The final judgment—the canonical solution of Secretary McNamara—was that the United States would counter the Soviet ABM by greatly expanding the number of warheads that we could throw against the Soviet Union. Indeed, by the time I left RAND, we were already talking about some 50 thousand warheads to overcome Soviet defenses. In other words, we were going to expand our offensive capabilities geometrically to deal with Soviet defense. That was the initial American reaction to the problem of ballistic missile defense. Therein also, more than coincidentally, lay the birth of the MIRV. The way we were going to add large numbers of warheads was to fractionate the payload of our missiles. Several years later we proceeded to do precisely that—

for entirely different and perhaps more dubious reasons. In all this there is a moral to be learned, which I shall attempt to develop later on.

In the late 1960s Secretary McNamara was informed by his President, Lyndon Johnson, that contrary to the Secretary's own advice the United States was going ahead with its own ABM system—then known as the Sentinel. The Sentinel would provide a thin-area defense designed to stop a limited number of warheads coming into the United States. It was, I think you will all recall, the period when the Red Chinese (more recently known as the People's Republic of China) were supposedly on the march under the malevolent guidance of Lin Piao. Supposedly the Chinese were preparing to encircle the cities from the rural areas, which we interpreted to mean they were going to destroy the industrial nations through guerilla warfare—as in Vietnam. A good deal of apprehension was expressed at the time by Secretary Rusk and by the President about the Chinese threat. What would happen when this billion people were armed with nuclear weapons? That small prospective Chinese capability turned out to be the principal argument for thin-area defense.

When President Nixon came into office, there was a careful reexamination of our ABM potential—and the Sentinel system was transformed into the Safeguard system. That transformation occurred as a result of a study led by David Packard which concluded that the thin-area defense did not really serve our puposes—and the appropriate objective was to defend our missile fields. That was what the Safeguard would do. Unfortunately, it was exactly the same hardware that had previously been intended for a substantially different mission and it was not particularly suitable for the new mission.

At that time I was at the old Bureau of the Budget, where one of my duties was to supervise the flow of water projects, dams and post offices that would lubricate the creation of the Safeguard system. I was also in charge of reviewing the '71 Army budget. The Safeguard system turned out to be the only weapon system development in my experience in which staggering overruns were already revealed prior to the inception of work. Those experiences provided much of my background in ballistic missile defense. Later, as Secretary of Defense, even after the signing of the Moscow ABM Treaty in 1972, I strongly supported, despite Congressional opposition, steady research and development activities in BMD. I want to stress these credentials: I have no objection and have had no objection, to a vigorous R&D program—which at the moment is the principal activity of the Strategic Defense Initiative. I want especially to stress that I have no objection to such an R&D program in light of the cautionary comments that will follow.

My only other association with ABM was being briefed as part of the Scowcroft Commission on the Fletcher and Hoffman reports. I believe I should confess that I may be the source of that rather rough-and-ready estimate of one trillion dollars for the complete SDI. That was simply an extrapolation based upon the old days of the Safeguard system and the cost overruns I observed at that time.

Let me turn now from these historical reminiscences to what is hopefully called the "real world of today." I go back to the President's speech of March 1983—in particular, the suggestion in that speech that some day nuclear weapons would be rendered impotent and obsolete, and that American cities might be safe from nuclear attack. The speech did not provide a complicated assessment of the role defense might play in strengthening deterrence. It held out to American citizens the unqualified hope that they need not forever live with the nuclear threat over their heads. Through the vigor of American technology, some day—even if not until the 21st century—our cities would once again be safe from nuclear attack, as they have been for most of the nation's history. In that lay the political appeal of the speech—and we should understand that its appeal is fundamentally political—for invulnerabilitiy to nuclear assault is what the American public believes is going to be achieved.

Since that time there has been a dramatic change in the nature of the argument. In the follow-up to the President's speech a rather loose rhetoric developed within the Administration in which the most fervent supporters of the SDI began to speak of the immorality of deterrence. Let me make this admonition clear. Within the Air Force, within the Administration, and within the society as a whole, the justification for strategic defense should never be based on assertions regarding the immorality of deterrence. For the balance of our days the security of the Western world will continue to rest on deterrence. Those were—and are—reckless words.

There is no realistic hope that we shall ever again be able to protect American cities. There is no leak-proof defense. Any defense is going to suffer some erosion at best. An effective opponent will develop defense suppression techniques and will punch a hole through any space-based defense that is deployed. (I cannot go into more detail on that.) Moreover, even if we were discussing a hypothetically leak-

proof defense, we would need to bear in mind that there are means of delivery of nuclear weapons other than by ballistic missile. For a nation that has very limited air defense capabilities, compared for example to the Soviets, we should recognize the relative ease with which our defenses can be penetrated by air-breathing vehicles. If we were ever to deploy ballistic missile defense, it would impose upon us the corresponding costs of developing or attempting to develop comparably effective air defenses.

I point this out here at Mitre, because the United State Air Force has long argued that air defense systems are penetrable and will always be penetrable. If that were not the case, we would not be expending the resources we presently are on the B-1. The United States has long seacoasts. In contrast to the Soviet Union, the bulk of our population lies along the coast. We are also the very nation that has led the way in the development of the sea-launched cruise missile (SLCM). There is no foreseeable way that we can preclude such missiles impacting on our cities—even if we had a perfect ballistic missile defense. The fact that we have moved ahead with SLCMs is perhaps analogous to our early movement into MIRVs. Since we are more vulnerable to SLCMs, it suggests there may be an absence of coordination between the development of the ballistic missile defense and of the offensive weapons.

There is no serious likelihood of removing the nuclear threat from our cities in our lifetime—or in the lifetime of our children. If those cities are going to be protected, they will be protected either through effective deterrence or through the forbearance of those on the other side. And it is for that reason that cries of the immorality of deterrence are both premature and pernicious.

Only the United States and the Soviet Union have in their historic roles been so powerful that defense against all threats might appear to be within their grasp. This is in sharp contrast to the European experience. No European power has been in a position to believe that by its own unaided efforts it could unilaterally provide perfect defense. The historic experience of the U.S. and Russia has been different. These two societies might reasonably hope to achieve defense or deterrence unilaterally. Traditional attitudes in both the United States and the Soviet Union have stressed this unilateralism—in contrast to the presuppositions of our allies.

We in the United States have been even more inclined than the Soviets to believe in the unilateral capacity to achieve perfect defense. Russia, both Soviet and Imperial, has been repeatedly invaded, has suffered grievous damage, and has survived largely through its own efforts. But the United States throughout its history has been secure here in the Western hemisphere. The American psyche believes that perfect defense should be attainable. In that we differ from all other nations. It is this unique belief which underlies the current hope for SDI. What I have said, I believe, indicates that this hope is illusory.

Where does the Strategic Defense Initiative stand today? As I have indicated, it has undergone a remarkable transformation. The argument is no longer that somehow we can protect American cities perfectly. Instead the argument has become that maybe, not definitely but maybe, strategic defense would permit us to improve deterrence—and that the mix of offense and defense would lead to a more stable world. A plausible argument—but one should be keenly aware of the dramatic change that has occurred.

It is certainly not impossible that the introduction of defensive capabilities might improve deterrence. Indeed, that had been the general aspiration, if not the conviction, prior to the signing of the Moscow ABM Treaty in 1972. Particularly in light of the impressive growth of Soviet counterforce capabilities since 1972, such a possibility deserves careful examination, or more precisely, reexamination.

A number of studies have been done which, I believe, have effectively demonstrated—within the assumptions of the study—that there are certain cases in which a mixture of defense and offense would improve the position of the United States, improve the position of the Soviet Union, improve world stability, and provide a strategic relationship in which, if nuclear war did nonetheless come, there would be less damage. All of these studies rest upon the assumption that the offense is constrained.

Remember the 1960s, the Secretary McNamara's reaction to the Soviet ABM system. Are the Soviets likely to be any less "offensive-conservative" than we were then? Given the Soviet Union's political ambitions, or its neurosis, or its quest for world domination, or its Marxist Leninist creed (depending upon whose eyes one is looking through), how likely is it that in the event of an American deployment of substantial strategic defense, the Soviets would agree to a constraint on offensive capabilities?

I think that the actual history of the American reaction in the past is one thing that we should bear in mind as we look to a hypothetical Soviet reaction in the

future. If the Soviets were to accept a constraint on their offense, it would require a minimum of trust. It would require a mutual approach to arms control, and that mutuality would almost certainly be reduced by our own efforts unilaterally to achieve general strategic defense capabilities of the type involved in the SDI. Moreover, we should not forget that we have more or less been putting aside the air-breathing threat—in a period in which the Soviets could have many more submarines equipped with SLCMs at sea. Indeed, 15, 20, or 30 years from now, they might just have developed the stealth technology that we ourselves are developing today—thus making the penetration of an air defense system relatively more easy than at the present time.

Let us go beyond the nagging question of the likelihood of a constrained offense, which is the only way in which greater stability is achieved in these models. Let us now look at some other issues. First is the issue of cost ratios. The historic judgment (or really, intuition) in the mid-60s was that the cost ratio between defense and offense was on the order of five to one. In other words, one's opponent could, by an investment of 20% of one's own investment in defense, create the offensive forces that would neutralize that investment in defense. Conversely, it would require an expenditure of five times as much on defense to neutralize the effect of the opponent's creation of additional offensive capabilities.

It is now hypothesized that these cost ratios have modestly improved since the 1960s, although that argument is somewhat flimsy. It is suggested that the ratio is now on the order of three to one. But that judgment primarily rests upon a single change: the belief that we can intercept Soviet missiles during the boost phase prior to separation of the re-entry vehicles. Nonetheless, it is clear that the ratio is still strongly weighted against defense and will remain so. If one is to put up a defense it will require the opponent to constrain his offense. Otherwise he will be able to force you to misallocate resources to the point that you may no longer be able to protect yourself. And this may be true, even aside from the air-breathing threat.

Given constrained budgets, the adverse cost ratio means quite simply that if one starts down the full-defense track one is inevitably facing the drawdown of conventional and other forces. Here, amongst our Air Force friends, I must confess that if I were an officer in TAC, I would be very much concerned about marching along that trail beyond deployment. Indeed, I might even be concerned if I were a SAC officer. The problem may be even more painful for the Army. To illustrate the point, the fiscal year 1971 budget, first submitted by the Pentagon, proposed a reduction of seven Army divisions and a substantial Europeanization of European defense. Of course, the Army did have the honor of developing the Safeguard system. But it also seemed embarked on the path to eating itself out of house and home—at the cost of its conventional capabilities. That problem has not gone away; it is likely to recur.

All that I have discussed to this point involves conditions before the Soviet Union begins to take serious countermeasures. One of the reasons the Scowcroft Commission stressed the need for a larger missile like the MX was to provide the throw-weight that might be needed to carry penetration aids. If one looks at the two strategic force structures at this time, and if one asks which of the two sides has the throw-weight to move a substantial array of pen-aids, it is clearly the Soviet Union. That does not constitute an advantage for the United States.

On another point, I mentioned earlier that the great improvement visualized for the defense-offense cost ratio rests on the belief that we can now intercept Soviet missiles during the boost phase. But this could remain quite hypothetical. Some of the proposed kill-mechanisms cannot reach down into the atmosphere. Thus the Soviets could shorten the boost phase, separate the warheads at an earlier point, and thereby preclude the gains in cost leverage that we now think we see in defense.

As yet, we have not solved the decoy problem, although we believe that we may. Nor have we solved the problem of assuring communications with those satellite systems that protect the United States. That will continue to depend upon ground-based facilities. I do not believe our targetting people in Omaha would have much difficulty in designing an attack with SLCMs that would take out those communications points.

So much for some of the technical problems in developing a workable and cost-effective system. However, let me reiterate: I strongly support a vigrous R&D program for strategic defense. But all of these matters must be soberly and responsibly faced—before we seriously consider deployment.

Let me turn now to the special problem of our West European allies. During the first burst of enthusiasm here for SDI, there was a good deal of protest from Western Europe—indeed horrified protest. There was a kind of ironic quality to that. If we were really able to do what the original speech suggested we might do—provide total protection for American cities—there might be a full restoration of the Ameri-

can strategic dominance of the 1950s and 1960s. Western Europe would again be fully protected—if one believes that strategic dominance can be restored. However, it is not believed, largely for the reasons that I have already laid out. Because of the worries of our Western European allies, it has not been stated that the SDI is not just for North America, that instead we are prepared to provide it to everybody. Our European allies can have this defense; the Japanese can have it; indeed, in the latest variant, the Russians can have it.

Assuming the Europeans wanted to deploy, who would pay for such a deployment? Would it be the American taxpayer? I rather doubt it. Those do not seem to be the noises that I hear coming from Capitol Hill. Would it be the Europeans? If so, what would be the consequences for their conventional capabilities—if they were actually to move down this line? And how effective would such a defense be in West Europe? Far less effective than it would be in the United States. There is, first of all, much less warning time. Flight times to West Europe are shorter, so there would be less opportunity to intercept in the boost phase and less opportunity to intercept after the boost phase.

In brief, rather than relying upon satellite systems in Western Europe, we would quickly discover the primary dependency on terminal defense. I think that there would be great political difficulties in deploying such terminal defenses in West Europe. Indeed, I fear that deployment of such terminal defenses would make the recent start on the deployment of the Pershing II a political picnic, relatively speaking. Moreover, given short flight times, the Europeans are subject to attack by air-breathing vehicles, even more than we are in the United States. And finally, if the Europeans were to proceed down this line, the inevitable consequence would be a drastic weakening of the direct defense embodied in their conventional forces. And the conventional deterrent remains perhaps the weakest link in the entire Alliance structure. So it would seem ill-advised for us to urge our friends to direct their resources away.

I turn from the special problems of Western Europe back to the bilateral relationship. What would be the impact of the introduction of space-based capabilities, not assuming that they had suddenly and successfully been deployed, but during the actual process of deployment. The likely outcome would be to create instabilities during the entire period of deployment. The process would be rendered particularly unstable because the system would be space-based. And the advantage of striking first, for either side, would be far greater than is the case for terrestrial capabilities. We must not assume that the Soviets will allow us any unilateral advantage. And in the instabilities of the unavoidable superpower competition lies the potential for disaster.

Finally, we should be aware that, even if the strategic defense system were to work reasonably well, and even if it were to enhance stability, it is still not certain that so large an investment—a trillion dollars is probably a good number—would be cost-effective in light of the other capabilities, particularly the conventional forces, that would necessarily have to be sacrificed under prospective budget constraints. A heavy additional burden on the defense budget is scarcely what is required, if we are to maintain a balanced force.

As you no doubt have observed, I have not been entirely positive in my assessment of SDI. So let me conclude on the issue of what to do. Enough has already been said to suggest that, aside from proceeding with appropriate R&D activities, we should proceed very cautiously. Yet, there is a good deal of rhetoric floating around that we are now going to replace "mutual assured destruction" with "mutual assured survival." I find that rhetoric interesting. I do not know that anyone has attempted to define, as yet, precisely what mutual assured survival is. But even were it better defined, I rather doubt that it is achievable. We must be careful not to be swept away by rhetoric. It would be irresponsible for us to base our defense posture on rhetoric that may sell well on the political scene but bears little relationship to the underlying technical, budgetary and strategic realities.

Whether or not the President should have said what he did in March 1983 has now been overtaken by events. One cannot excise the words that the President spoke. It is an illusion of the critics of the SDI that somehow or other all this can be rolled back. It cannot be. With all of the consequences—creating alarm amongst our allies, reinforcing the Soviet belief that the United States is now attempting to restore strategic dominance, and the impact of that belief on negotiations and on arms control—with all of these consequences we shall now have to deal. We are obliged to look at what strategic defense might give us, not only in terms of force deployment, but at the bargaining table. It is, of course, incumbent upon us to think through the strategic consequences—before we proceed to deploy such forces. In its final report to the President, the Scowcroft Commission offered the following guidance:

"The Commission was requested to review the Administration's proposals for research on strategic defense. In the Commission's view, research permitted by the ABM Treaty is important in order to ascertain the realistic possibility which technologies might offer as well as to guard against the possibility of an ABM breakout by the other side. But the strategic implications of ballistic defense and the criticality of the ABM Treaty to further arms control agreements dictate extreme caution in proceeding to engineering development in this sensitive area."

The Commission's comments were deliberately understated. It is no longer reasonable to pretend that we have not entered a new era touched off by the President's remarks. On the other hand, it is incumbent upon us not to push ahead willy-nilly, while neglecting the impact upon our relations with the Russians and the consequences for arms control. I can think of no better guidance in the period ahead than this most sensible admonition in the Commission's final report.

Finally--what purpose might these strategic defense possibilities serve? The Soviet Union has historically shown an immense, perhaps exaggerated, respect for American technological capabilties. And, in the course of the last 18 months, we have certainly gotten their attention with respect to strategic defense. As I have indicated, that has its unfavorable side, but it also has the potential for being immensely useful. The President has repeatedly spoken of his desire to proceed with arms control. It is apparent that we should now have delineated a grand design for an arms control agreement with the Soviet Union. The new grand design is remarkably similar to the old grand design--the one of 1972. You may recall that the Soviets were keenly aware of the inadequacies of their ABM system (whose capabilities we had much exaggerated). When the United States began actually to deploy the Safeguard system, the Soviets were deeply alarmed about the immense advantages of American technology. They therefore proceeded in the negotiations to insist upon a limitation on ABM systems.

That ultimately resulted in the 1972 Treaty. Throughout the entire period President Nixon took the position—I believe correctly and certainly courageously—that there would be no ABM treaty unless the Soviets agreed to limitations on offensive forces. Although the Soviets wanted no agreement at all on offensive forces, their eagerness for the ABM treaty forced them in effect, to accept the 1972 agreement on offensive forces.

That grand design—of limits on Soviet offensive forces in exchange for constraint on American defense technologies—lies before us again, beckoning. If, through Soviet fears of American space technology, we were able to achieve a breakthrough in arms control negotiations (in a rather unpromising era), the President's launching of his new initiative would have fulfilled its most laudable purpose. In short, perhaps the best use of the Strategic Defense Initiative lies in that much maligned role of bargaining chip. Indeed, one might say, the Strategic Defense Initiative is the quintessential bargaining chip.

Dr. SCHLESINGER. I think that, as a bargaining chip, it is ideal, and it should be sustained. But in order to be a bargaining chip, one has to be prepared to bargain over it. If we say that under no circumstances are we prepared to bargain, then it is useless as a bargaining chip, and, given the Soviet Union's frame of mind, it is a source of frustration at the table that will worsen bargaining with respect to other aspects.

Senator EXON. Thank you, Dr. Schlesinger.

Speaking as one member of this subcommittee, I know of no one in whom I have more overall confidence, who comes before the subcommittee and speaks his mind, who I think is one of the true experts in the whole world on all of these subjects that we are talking about, than you.

Now, having said that, I am brought to the next question on what is going to happen on the floor of the U.S. Senate this afternoon.

Having said all of those fine things, I cannot see how you can be as far off base, as I think you are, with regard to the MX missile. [General laughter.]

MX MISSILE

I led off with the bargaining chip question, and I suspect that you feel that at least research and development and the threat of deployment of an SDI is much more of an important bargaining chip than the MX missile. I notice that in the last week, though I am not sure whether he was quoted exactly accurately or not, Ambassador Nitze has indicated that he did not think the MX missile was a significant bargaining chip under the present situation in Geneva.

Dr. SCHLESINGER. I think the Ambassador said that it would not be immediately relevant to the bargaining situation. He did not say that it would not be useful to us over time.

He did say that it would not be immediately relevant to our position.

Senator EXON. What does that mean, immediately relevant? Do you mean he is saying that it might be more effective further on down the road, after it is deployed?

Dr. SCHLESINGER. What he says is if the Senate or one House or the other were to overrule the MX, that would not bring about an immediate deterioration of our bargaining position at the table in Geneva now. That is what he said.

With regard to your earlier comment, if I may slip into that subject before you go on with your question——

Senator EXON. Yes, go ahead.

Dr. SCHLESINGER. May I say this. I think SDI is, indeed, potentially, a more important bargaining chip than is the MX missile. This is not in denigration of the MX. I think the MX has great qualities of its own. But in response to the issues that you raised, it is more important to have the SDI for bargaining purposes.

THE MX AS A BARGAINING CHIP

Senator EXON. Then, if I might digress for just a moment, I am going to serve up a softball to you. I know I should not, but I am going to serve it up to you anyway because I have such great respect for you.

Tell me in as short a time as you can how the MX is a bargaining chip or was somewhat of a bargaining chip when it was first conceived. I think it is agreed by all that it is a missile that was conceived because we had intelligence information that indicated the Soviets had targeted all of our Minutemen II's and III's and our Titans, too, at that time, and that we had to build an MX missile for the reason of strengthening deterrence, otherwise we would be standing naked in front of the world. It was believed by many that since a first strike from the Soviet Union could wipe out all of our Minutemen II's, all of our Minutemen III's, and all of our Titans, that we had to have something in a mobile basing mode. That was the heart and soul, as I understand it--though I was not here at that time—of the MX missile.

If that is true, how do you justify putting the MX missile right back into those same holes that have been targeted for over 10 years by at least two Soviet warheads?

Dr. SCHLESINGER. Senator, I think that the comments you make are drawn from the 1980 political campaign. They do not go back to the time that we laid down the MX missile.

The MX missile was originally designed to go into the Minuteman holes. At the time, in 1973, we did not believe that the Soviets had any serious counterforce capability because they were still stuck with a second, and backward, generation of missiles.

In 1973, we saw the beginnings of their program of the development of the SS-17, SS-18, and SS-19. There was an explosion of R&D effort that took place after May 14, 1972, when the ABM Treaty was signed.

So, when we designed the MX, it was designed specifically for bargaining purposes. What we were prepared to do was to say to the Soviet Union if you do not go ahead and develop those counterforce capabilities that are embodied in the SS-17, SS-18, and SS-19, we will not go ahead with the MX.

We were saying that it was better for both sides never to develop that much counterforce.

Originally it was designed as a bargaining chip.

But it was not successful as a bargaining chip, which you will point out to me.

We have moved along a decade. The Soviets have developed substantial counterforce capabilities which the United States lacks.

Does the MX still have a bargaining chip aspect? I think the answer to that continues to be yes. And the reason for it is that the Soviets have the bulk of their strategic forces vulnerably based in ICBM silos. At the moment, the United States has very limited counterforce capability. The MX, as it is deployed, increases our counterforce capability. It makes the Soviets feel the vulnerability of those silos, and if I were the Soviet leader, there is nothing that rationally would force me to the bargaining table more than the deployment of American counterforce capabilities that threaten the basis of the force.

The Soviet Union has always behaved at the negotiating table on the basis that they are not going to give up anything just to make us happy. An open production line is what helps, it seems to me, bring the Soviets to recognize that if they are unprepared to bargain, it will undermine the stability that is presented by their own forces.

Now that is the inverse of the argument that is sometimes made on Capitol Hill, that this is a so-called first strike weapon that threatens the Soviet forces. It is because of that argument that, indeed, the Soviets should be forced by logic to the bargaining table. I would have preferred, though, that the Soviets had accepted the implicit offer of 1973, had refrained from the deployment of these heavy counterforce weapons, and that we could have given up the MX then.

Senator EXON. Thank you, Mr. Chairman. My time is up.

Just let me say, in response, Dr. Schlesinger, that while you make a very convincing argument about what the MX may have been intended for in the original instance, it seems to me, that events overcame the initial planned deployment of the MX in vulnerable silos, because when you started up with MX, you did not even think those silos were vulnerable.

Therefore, I think a significant case could be made that perhaps the only reason the MX missile was not obsolete before it went into production was that a change became obviously necessary because of the increased targeting by the Soviet Union. That is why the mobile system was designed. I suggest to you that it was designed and came into play before the 1980 Presidential election.

Thank you, Mr. Chairman.

Dr. SCHLESINGER. Mr. Chairman——

Senator WARNER. Yes, would you please respond to that.

Dr. SCHLESINGER. I would like at this point to agree, for the most part, with Senator Exon. Indeed, if one goes back to the summer of 1973, when I announced the MX, I said that if there were the development of serious Soviet counterforce capabilities, we would then have to reconsider the basing mode which was then intended to be the MX silos. Indeed, that has taken place, and, indeed, by logic, we should be reconsidering the basing mode.

I think there were a few hints of such reconsideration in the Scowcroft Commission recommendations. We have not gone very far, in the long run, if we are to have a significant MX force. We should be looking to a less vulnerable basing mode. That part of your statement, Senator Exon, is absolutely right.

You are quite right with regard to the campaign of 1980. The concept of mobile missiles preceded that campaign. Indeed, we, as early as the 1960's, were talking about deploying the Minuteman on rail mobile systems. There is a famous incident, an alleged incident, when Mel Laird became Secretary of Defense. He went down to the Air Force, and the Air Force had this wonderful model laid out with Lionel trains with an MX missile on board. He looked at this model. The Air Force people were very proud of the concept. Mel Laird said, "Is that the city of Chicago that I am looking at?" There was the Minuteman, chootling along the tracks in Chicago. He reminded them that the State of Wisconsin was very closely colocated with the city of Chicago, and that was the end of that particular mobile missile concept.

So that did antedate all of that discussion.

You are quite right, also, Senator, that some of the value of the MX disappears with its vulnerability, but only some. The MX is designed for two purposes. One was to close the window of vulnerability, so called in the 1980 campaign. That purpose obviously is not served. The other is to provide us with throw-weight, with counterforce capability. That purpose has not been vitiated by any developments in recent years.

Senator WARNER. Senator Thurmond?

Senator THURMOND. Dr. Schlesinger, we are glad to have you here.

I recall some years ago the period when you served so ably as Secretary of Defense.

Dr. SCHLESINGER. Thank you, Senator.

Senator THURMOND. Dr. Schlesinger, I want to ask you two questions.

MX MISSILE

We are going to vote on the MX missile today. Every Senator, of course, has to make up his own mind. In view of your vast experience in the military, having served as Secretary of Defense and in other positions, if you were a Member of the Senate, from the standpoint of the security of this country, would you vote for the MX missile or against it?

Dr. SCHLESINGER. I would vote for it, Senator.

Senator THURMOND. Now, we are also considering the Strategic Defense Initiative which the President has recommended. We are considering only now the research phase of it. If you were a Member of this Senate, would you vote for the research phase of the SDI?

Dr. SCHLESINGER. Yes, sir.

Senator THURMOND. That is all, Mr. Chairman. I thank you very much.

Senator WARNER. Thank you, Senator Thurmond.

U.S. SDI AND SOVIET OFFENSIVE FORCES

Senator Levin, would you indulge the Chair for a moment for one clarification?

Senator LEVIN. Yes.

Senator WARNER. You have stated very succinctly that you think the SDI is a bargaining chip. But at what point can you encapsulate it such that it is a chip?

I say this against the background that you cannot verify the presence or absence of research and, therefore, it could not be during the research phase.

Would you be more specific about which time in the logical progression of SDI it would become, shall we say, encapsulated in some form where it could be put on the table, saying here is the chip?

Dr. SCHLESINGER. I think, Senator, that there are two phases. The first phase is here and now. We can spend a good deal of time saying that the Soviet Union should share our view that one cannot monitor research. The Soviets, I think, would be quite satisfied to curtail this technology program, and they believe that they have sufficient insight into the workings of the American democracy that they can have some confidence that research moneys, if not appropriated by the Congress, will not be spent.

Senator WARNER. Well, reciprocally, how could we accept and monitor a Soviet offer to stop research?

Dr. SCHLESINGER. Oh, we cannot monitor what the Soviets are doing until they research the stage of experimentation. The pure research we cannot monitor. The Soviets cannot monitor it by national technical means. They will have to have recourse to the New York Times, or to Time or to CBS.

Senator WARNER. Well, they are sitting here today.

Dr. SCHLESINGER. They can monitor because the capacity to monitor the operations of a free society are vastly easier.

Senator WARNER. Of course. They have the advantage of doing it that way, and they don't need formal monitoring methods. But we do not have the reciprocal ability.

In other words, if we were to shelve SDI here, to stop the research and curtail the funding, we have no means to determine that they are, in like manner, doing that, and we would soon find ourselves at a disadvantage.

Dr. SCHLESINGER. Absolutely.

Senator WARNER. Then how can it be a bargaining chip at this point in time?

Dr. SCHLESINGER. Because at this point it cannot be a bargaining chip, I think, on the basis of your implicit criterion that this be a treaty equally enforceable and verifiable on both parties. It cannot be under those circumstances.

However, if one is willing to say that the United States has greater technical capacity, particularly in the SDI capabilities that are space related, which I think everyone grants, and that the Soviet Union is prepared to pay a higher price to curtail that area of technology, and that this price may include limitations on their offensive capabilities, even though it is not a situation that is symmetrical as you, I think, very clearly point out, then it might be to our advantage to accept the proffered Soviet price in terms of their offensive capabilities in exchange for limitations on our own research program, even though we know we cannot enforce equivalent constraints on their research program in this area.

Senator WARNER. I think you have made the proposition clear.

Thank you, Mr. Levin, for allowing the Chair to introduce that thought into the record.

Senator LEVIN. Thank you.

ADMINISTRATION SDI FUNDING REQUEST

It is good to have you with us, Dr. Schlesinger.

I am a little uncertain about two of your answers to a question of Senator Warner and a question of Senator Thurmond, which I think we ought to clear up for the record.

Senator Thurmond asked you whether you would vote for the research phase of SDI. I presume he meant as the President proposes it.

Dr. SCHLESINGER. I think I may have answered that question earlier, Senator. What I indicated—and I think I tried to be as elusive as I could be—is that there is a considerable amount of cut insurance in the request of the administration, and that very few programs that I have ever seen, research or otherwise, can benefit from a 150-percent increase.

Senator LEVIN. I also know what your testimony is. But I think the impression you may have left with Senator Thurmond is that you support the President's research proposal.

Dr. SCHLESINGER. If so, I think I answered his question as he raised it. But if I left that impression, I should not have done so.

I think that the Congress, the Senate, must carefully scrutinize that request because it has an extraordinary growth rate for a research project.

Senator LEVIN. I have read your testimony before the Foreign Relations Committee, and I know what your testimony was here this morning.

Senator Warner asked a question about whether or not reducing the funding in research from the request would put us at a disadvantage. I would like you again to state your answer to that question.

Dr. SCHLESINGER. Senator, this must be a slightly grayer answer, as it were.

We were carrying this program right after 1972, the ballistic missile defense program, on a research budget of approximately half a billion dollars a year, which would be a research program today of about $1 billion a year, given inflation.

There are many things that exist in that program which are justifiable irrespective of whether we are proceeding with the SDI.

I think we can get the protections against the Soviet surprise with a program in the billion to billion and a half range. We can get protection, though with lesser confidence against a Soviet breakout, in, say, the $1.5 to $2 billion range. I think that goes to the heart of your question. We will know what the Soviets are doing with all the confidence necessary to provide us with assurance at a figure less than the administration has requested, substantially less.

Senator LEVIN. That is what I thought your answer was. But then, am I not correct, that reducing the program to that level, which you just described, the $1.5 billion would not put us at a disadvantage?

Dr. SCHLESINGER. I think I said that it would not put us at a disadvantage in respect to the question that you asked, which is our ability to monitor the Soviet effort and to hedge against the breakout.

The program has more ambitious objectives, of course. It is looking into capabilities that are more advanced than the Soviets can deploy, and that implicitly would require additional funding.

But to the question you asked, for a sum in the $1.5 to $2 billion range, I think we have ample protection against what the Soviets are doing.

Senator LEVIN. Are you saying that you consider $1.5 to $2 billion an ample research program?

Dr. SCHLESINGER. Yes.

I think I indicated earlier that that would be a substantial one. But I think that if one is ambitious in this area, the growth rate should carry us up toward the $2 billion mark rather than the $1.5 billion mark.

SDI AND ARMS CONTROL NEGOTIATION

Senator LEVIN. You have indicated that this is an ideal bargaining chip and I want to pursue that with you. It seems to me that there are just all kinds of signals which are being given, some of which are inconsistent on the bargaining issue.

We have a Secretary of Defense who says if this thing is feasible, we are going to deploy it and we are not bargaining it away, period. He was that blunt on "Face the Nation."

We have a Secretary of State who says that we are going to negotiate space defense weaponry at Geneva.

Now to me that is a very different signal.

I would like to understand from you, who believes that, as you phrased it this morning, one must be prepared to bargain about it, as to when you believe we should begin to bargain about deployment. I understand the research answer that you gave to Senator Warner. What I am interested in is the deployment question, whether to deploy and, if so, how to deploy. When should that bargaining begin?

Dr. SCHLESINGER. I think that, ideally, that bargaining should have begun 3 days ago, or 5 days ago. Indeed, I had hoped that since the Soviets were immensely eager to start this bargaining, that we could have done so last September, as you will recall the interplay between the two capitals.

I think that, in a sense, the optimal price may have been reached early on for this capability. The Soviets want to foreclose it, and the longer we fiddle with it, the lower will be the price they will pay because there is less to foreclose.

So if one wants to sell off SDI at the highest possible price, basically now and in the recent past is and was the time to do so.

Senator LEVIN. You are talking about negotiating not just about research but about whether and how to deploy?

Dr. SCHLESINGER. Both research and deployment. I think we should be prepared, in effect, if the Soviets are prepared to pay an appropriate price, to reassert the ABM Treaty—if the Soviets are prepared for the price. That is one of the things that gives us bargaining leverage.

Senator LEVIN. Do you understand or have you read what the instructions are to our negotiators relative to that issue?

Dr. SCHLESINGER. I have not, but my understanding is under no circumstances are they to bargain these matters away.

Senator LEVIN. Or to bargain about them?

Dr. SCHLESINGER. You would have to ask the negotiators about that. I think that the game that we have been playing, Senator, has been laid out in the press, that we are going to read the Soviet Union a lecture on the advantages to both sides of the deployment of strategic defenses, what the Soviets refer to as a seminar.

The Soviets have indicated a great deal of impatience, as it were, with that seminar. We are going to tell them that they are wrong in their resistance to strategic defense. That does not sound to me as if they are going to discuss strategic defense in a bargaining context. It will be in a missionary context.

Senator LEVIN. So it is your understanding, as it is mine, that whether and how we deploy is not bargainable at the moment?

Dr. SCHLESINGER. That is right. At the moment we are in a much more ethereal discussion of the hypothetical advantage of a mixed force of offense and defense.

Senator LEVIN. But I also understand very clearly your answer to me that both whether and how we deploy and the research relative to SDI should be bargainable now, indeed 3 days ago.

Dr. SCHLESINGER. Yes, sir. I have been on that position since the President made his speech of March 1983. Whatever the disadvantages of that speech, it had great advantages prospectively at the bargaining table, and I have been eager to explore whether those could be seized.

Senator LEVIN. Then, finally, is it your understanding that our allies believe, based on public statements that the President has made when Prime Minister Thatcher was here, based on statements made when Prime Minister Craxi was here, that, in fact, we are now prepared at this point to negotiate the whether and how issues relative to deployment?

Dr. SCHLESINGER. I think that there is some ambiguity about that. But it is clear that the allies have been told that the United States will bargain at the table with the Russians prior to deployment. Whether they have been given to understand that we are prepared to bargain with the Soviets now on deployment I think is much more conjectural. I would myself doubt that because it would be inconsistent with the negotiations. While diplomacy allows some room for a smokescreen, there is only a certain amount of smoke that is tolerable between allies.

SOVIET RESPONSE TO SDI

Senator LEVIN. You indicated, I believe, in your testimony—oh, I'm sorry. My time is up.

Senator WARNER. Go ahead, please, Senator. Take another question.

Senator LEVIN. Thank you, Mr. Chairman.

I believe you said that the SDI system, could be easily countermeasured, and I think you said either here today or at an earlier time that the incentive on the part of the Soviets, when faced with SDI, is not to reduce, but to expand their offensive capabilities.

Can you describe for us in a little more detail why you think the Soviet instinct, when faced with SDI, will be to expand their offensive capabilities and to try to countermeasure SDI rather than to cut their offensive forces, which presumably is our number one goal at Geneva?

Dr. SCHLESINGER. I think that that is very clear cut, Senator.

I must go into a little history again, if I may.

In the 1960's, the Soviets began to deploy a very primitive ballistic missile defense system around Moscow, the so-called Galosh system. It was plain that the technology was quite backward, even compared to what we had at that time. We were not deploying.

Secretary McNamara took the decision that the United States would deploy one additional RV for each and every Soviet interceptor that the Soviets deployed—that is, that our response to the Soviet system, in the then-Secretary's view, would be to expand our offensive capabilities. His view was that we could do that cheaply and that the Soviets would not be able to interfere with a ballistic missile attack on the Soviet Union because we would overwhelm the defense.

That was in the middle to late 1960's.

Now, I submit to you, Senator, that the Soviet Union is not likely to be any different in its behavior than the United States was in the 1960's. Indeed, Secretary McNamara is not normally regarded as very hawkish.

I submit to you, Senator, that the Soviet Union will not, to use the technical term, be any less offensive conservative than the United States then was. Quite the contrary. The Soviets have been

conservative and they have been offensive conservative, and they are, I think, almost certain to follow the same type of response to a hypothetical ballistic missile defense deployment by the United States if that is a generalized defense deployment. I am not talking now about hard defense in the middle field. The reactions then might be quite different.

The Soviets have said that. The Soviets have already gotten the throw-weight capabilities to make such a response.

Incidentally, if I may interject into my own remarks, the Soviets are in a much better position to respond to ballistic missile defenses than we are because of the throw-weight advantages that we keep pointing out quite accurately that they have.

The Soviets already have the throw-weight capabilities. They have the missiles. They are now facing a question of whether to reduce certain missile forces as a result of the deployment of mobiles under the constraints of the SALT II Treaty, which both sides at least say they are observing. And the effect would be that it would drive them back to the equivalent of the SS–18, encourage them to deploy more SS–18's and SS–19's, simply to hedge against the American breakout of ballistic missile defenses.

I hope I did not go too far astray there, Senator.

Senator LEVIN. No. It was very helpful.

Thank you very much.

Senator WARNER. Thank you, Doctor.

I have just one or two wrapup questions.

It is a rare opportunity for me, as one of your former subordinates, to have you in front of me momentarily at the mercy of my questions. [General laughter.]

Dr. SCHLESINGER. Remember, Senator, that I vote in the State of Virginia.

Senator WARNER. That's correct. [General laughter.]

Dr. SCHLESINGER. I am a sovereign voter, sir.

Senator WARNER. You voted me in for 6 more years, and I am going to savor that. [General laughter.]

IMPLICATIONS OF "NUCLEAR WINTER"

We have an obligation, as a subcommittee and indeed as a Congress, to begin to look more seriously at a new concept about which I confess I do not know much, and that is nuclear winter.

My first question is how would you suggest we proceed? It seems to me that, if there is credibility attached to this concept, it begins to impinge on some of these nuclear options of a lesser scale which you have very carefully pointed out today which we must consider in any retaliation situation.

What guidance would you give the subcommittee for proceeding on this?

Dr. SCHLESINGER. Senator, while one cannot be precise about this, let me give you two or three areas into which I think the subcommittee might be prepared to look.

There is, in the first place, every indication from the report of the original committee of the National Academy of Sciences, I believe confirmed by the Pentagon, that the great source of the clouds that would cause the nuclear winter come from the burning

of cities, the debris in the cities, the soot that comes from the burning of cities, rather than attacks, for example, against silos.

It should reinforce our eagerness to stay away from targeting Soviet cities, and we should sing this loud and clear to the Soviet Union, the advantages to them of staying away from the targeting of Western cities. I would not be hesitant to provide hints to the Soviet Union, pointing out that they are a much more northerly country, more inclined to suffer from cold, with a continental climate more than the United States, so that the effects of a nuclear winter would be asymmetric on the Soviet Union.

Second, I would look at this in terms of the strategic options on the two sides. The United States has said that it is prepared to use very selective strikes as a way of reinforcing deterrence. The Soviet Union, by contrast, has said that its response will always be the overwhelming strike to destroy everything. Indeed, all three of these things—the doctrine, the targeting, and the weapon systems of the United States are much more consistent with avoidance of a nuclear winter than the doctrine, targeting, and weapons systems of the Soviet Union, which go to massive systems used without limitation. We can point out to the Soviet Union that if they were to execute the doctrine that they declare, the principal victim might well be the Soviet Union that lies in so northerly a latitude.

Third, I would look at the effects of different types of limited strikes that we have contemplated over the years.

For example, one of the things that has been considered at an earlier stage is going after the Soviet energy system, oil refineries and the like. This would hit the Achilles heel, so to speak, of the Soviet Union, not just to bring pressure to bear, in the hypothetical advance of the Soviet or Warsaw Pact forces against the West.

Oil refineries, given these concepts, might be a more unattractive target because of the soot and the involvement. So there are various areas.

But the fundamental point to bear in mind is, given the other nuclear weapons effects, which are extraordinary and horrifying, this may add very little to the overall repugnance to be attached to nuclear war.

Senator WARNER. Thank you.

I have one last question before we proceed to our next witness.

THE FIRST USE OF NUCLEAR WEAPONS

In the context of the MX being a first strike system in the minds of many—and I think reasonable men can differ on this issue—we, in this Nation, subscribed to the philosophy from the very inception of our nuclear strategy following World War II—and I emphasize following World War II—never to use nuclear weapons, our ICBM force, in a first strike.

There seems to be a dichotomy in the strategy with respect to the ICBM force and the failure of this country, for good reason, to subscribe to the no first use doctrine with respect to tactical weaponry in the NATO arena. The argument is made that if we fail to renounce first-use in NATO, that undermines our credibility of not initiating the use of the ICBM force in a first strike mode.

How would you address that debate?

Dr. SCHLESINGER. Well, about the last sentence of your question, I am bemused. I find it difficult to understand what these commentators are pointing to.

So let me go back to the beginning.

Senator WARNER. Well, it has been raised.

Dr. SCHLESINGER. Yes, it has been raised. It is a process of association which I think is not based on logic.

The United States and its allies since the 1950's have explicitly based the deterrence of attacks against the West on the prospect of initiating the use of nuclear weapons. That has been NATO strategy. That has also been American national strategy.

We have stated repeatedly in every posture statement and it has been reiterated by presidents of the United States that, in the event of a Warsaw Pact attack against Europe, the United States will initiate, and it has been quite ambiguous whether or not we would not use our strategic forces. On occasion, it has been explicitly said that we would use our strategic forces.

The United States has, since the 1950's, appeared to be, is judged to be, with its allies, inferior to the Warsaw Pact with regard to conventional forces. We have said that we will never attack the Soviet Union. We have said we would never initiate war with the Soviet Union with a first strike. But we have never said that we would not initiate the use of nuclear weapons in response to an all-out Soviet and Warsaw Pact assault against the West.

We are prepared to do that today. We are prepared to initiate. I think that this initiation of the use of nuclear weapons is in response to a hypothetical attack, massive attack, against the West by the Warsaw Pact. We would not be starting the war. We would, however, in those hypothetical circumstances, be initiating the use of nuclear weapons.

I think that it should be understood that, while we have renounced a first strike in the sense of going after the Soviet Union, we have regularly, since the days of massive retaliation, said that we would initiate the use of nuclear weapons.

There is, I think, some confusion about the semantics in this area. But we have never renounced initiation, and we should not until such day that we develop the will in the West to provide conventional forces that gives us assurance that they cannot be overwhelmed by the forces from the East.

I think this goes to the heart of it, Senator.

We cannot give up first use. We should leave obscure whether or not first use is forces based in Europe or off the continent of Europe. And, therefore, those who say that if we fail to renounce the first use of nuclear weapons in Europe it would undermine, if I understood your final sentence, our renunciation of the strategic nuclear weapon system, do not understand that we, the United States, have been prepared to initiate the use of nuclear weapons in the circumstances of a massive strike. We should continue that policy. We have never renounced it.

Senator WARNER. I thank the witness.

Indeed, Doctor, it has been a very profitable time period, the almost 2 hours that you have been before the subcommittee.

Dr. SCHLESINGER. Let me take 10 seconds to say the following.

PROTECTING OUR MISSILE FIELDS

There are strategic advantages of protecting our missile fields, but they may be offset by the political and arms control disadvantages of initiating a deployment of strategic defense forces.

Senator WARNER. Thank you very much, Doctor Schlesinger.

Now we have a very distinguished second witness this morning, Dr. Sidney Drell, the deputy director of Stanford University's Linear Accelerator Program. I would also like to welcome Dr. Drell on behalf of the subcommittee. I particularly thank you for your patience in waiting this morning. But I think you would be the first to say that you have profited from observing Dr. Schlesinger's outstanding presentation this morning.

Dr. DRELL. Thank you, Mr. Chairman.

You had a magnificent briefing and seminar, I would say, from Secretary Schlesinger, and I indeed think everyone profited from it.

Senator WARNER. I wish to assure you that the absence of Members here does not reflect in any way on the importance or lack of it that they attach to your testimony. Senator Hart is on the floor managing the time for those who wish to speak in opposition to S. Res. 71, and I am managing the time for those in favor. But fortunately, Chairman Goldwater is working with me on that, or, rather, I am working with the chairman. The chairman of the committee is taking this responsibility for the moment, but no one could replace Senator Hart. He will have the opportunity to examine your presentation, as will other Members, with great care this morning.

Thank you. You may proceed.

STATEMENT OF DR. SIDNEY DRELL, PROFESSOR AND DEPUTY DIRECTOR, STANFORD LINEAR ACCELERATOR CENTER, AND CODIRECTOR, CISAC

Dr. DRELL. Thank you, Mr. Chairman. I will be very brief.

I wish to submit to the subcommittee and for the record the report of a workshop that just recently completed its work at the Stanford Center for International Security and Arms Control.

This report represents the consensus of its 13 signatories who brought a very broad range of views and government experience to the workshop. It is a consensus on a limited set of high priority objectives and activities in strategic defense.

The report asserts five objectives for R&D work on defensive systems during the coming decade.

First is to discourage the Soviet Union from a breakout in defensive weapons. Second is to minimize the adverse effects of a Soviet ABM breakout. Third is to protect against military or technological surprises harmful to our security. As Dr. Schlesinger said, these three objectives require a healthy U.S. R&D enterprise in the relevant areas, in particular so that we will have the technology and a real possibility to counter Soviet measures.

Senator WARNER. Without objection, the report will be received in its entirety.

[Report inserted at conclusion of hearing.]

IDENTIFYING AREAS OF TECHNOLOGY

Dr. DRELL. There are two additional objectives that we asserted for the research work. I have already mentioned the first three. The fourth is to identify areas of technology or development which should be deemphasized or terminated, either because of their ineffectiveness or because of mischief they may cause to prospects for achieving essential arms control goals. The last of the objectives, the fifth, is to provide options for limited stabilizing defenses, as Secretary Schlesinger mentioned, if in the future a national need is established, perhaps for terminal defense of our ICBM's.

The workshop report also emphasized the importance of designing and executing the defensive R&D program within the ABM Treaty in ways that maintain the range of technical options without directly or de facto committing us to developing or deploying the system and without giving rise to the presumption that the U.S. is committing itself to a defensive weapons breakout.

The requirements for an effective military system, as this subcommittee knows better than anyone else, go far beyond demonstrating just the technical feasibility of the components of a system. But the first task in examining means to accomplish strategic missile defense is to identify critical technologies that would be required to implement various options or systems concepts.

The workshop concluded that it is now far too early for any program in strategic defense to consider technology demonstrations of types that could raise serious issues of compliance with the ABM Treaty. Almost all of those few technologies that do appear to be ready for such demonstrations can be tested within the treaty provisions.

In our consideration, we divided the work into three categories: the so-called conventional, or traditional ballistic missile defense, which we take to mean fixed round-based nuclear armed interceptor rockets and radars command guiding them. This is as originally envisaged and considered explicitly in the ABM Treaty of 1972. We also considered directed energy, that is laser, X-ray laser, and exotic beam concepts. Finally we considered supporting technologies, those which are necessary for an advance system to be integrated to support the mission for defense.

Conventional ballistic missile defense is currently the only candidate system for strategic defense which is based upon the tested integration of proven systems components. Thus, an option to deploy or threaten deployment of such a system, even of limited capability, must occupy a central role in any strategic defense planning. It is a major recommendation of this workshop and its disparate authors that the development and operation at Kwajalein Island of a test facility be supported, a test facility incorporating a single, integrated, but evolving, conventional, terminal defense system, a so-called "functional prototype" as opposed to an engineering prototype. And it also should support work on advanced offensive penetration aids, or pen-aids, which would be critical elements of any countermeasure by the United States to a possible Soviet breakout.

It was explicitly, I should add, not a workshop recommendation to consider reopening negotiation of the ABM Treaty, at this time to allow limited, possibly stabilizing deployments.

Senator LEVIN. May I interrupt you at this point, for a quick question.

Dr. DRELL. Yes.

Senator LEVIN. Where is that which you just mentioned in the report? I was looking for something about whether we should abrogate or reopen the ABM Treaty in your report and I cannot find it.

Dr. DRELL. I will find it here for you if you give me just one second.

If you will turn to page 15, where it says in the first long paragraph, where we talk about strategic, possibly stabilizing, limited deployments: "Of course, such a deployment, if it were concluded to be strategically advantageous, would require renegotiating some terms of the ABM Treaty—at least the provisions governing numbers of interceptors and radars, and probably mobility and deception as well." And at the very end (I am looking for the sentence), it says: "Members of the workshop differ on the relative weight and risks in reopening negotiations on the treaty and potential benefits of reducing ICBM vulnerability; consequently it is not a recommendation of the members that this course be explicitly considered."

Senator LEVIN. Thank you.

Dr. DRELL. That was in the middle of page 15.

DIRECTED ENERGY

Turning now to directed energy, we considered laser, X-ray laser, and exotic concepts. There is a general sentiment that research on directed energy killers is essential for protection against technological surprise and can contribute to deterrence of a Soviet breakout.

I will say that perhaps the most controversial of the workshop's choices is to eliminate infrared lasers, chemical infrared lasers, from consideration as ballistic missile defense weapons. Chemical infrared lasers have been proposed for predeployment in space to accomplish boost phase kill of ICBM'S. Such deployment would add a number of considerable disadvantages: costly redundancy in the systems as they circulate; vulnerability of the systems; the need to put vast energy stores in space.

The workshop concluded, and these are the words of the report, that these factors make such laser battle stations in space completely impractical, and, hence, for laser weaponry, our recommendation is to concentrate work on increasing the capabilities of visible or ultraviolet lasers, particularly ground based ones.

As to the nuclear driven X-ray laser, this presents a defensive weapons technology with some potential for employment in support of offensive operations as well.

Currently, there is a great uncertainty in the performance levels that can be reached or maintained against countermeasures. If the moderately high brightness levels, which have been discussed publicly, are achieved, X-ray lasers could be used as ASAT weapons, we note.

They may also be integrated into offensive weapon systems for suppression of retaliatory ICBM launches, following a first strike.

Since the Union of Soviet Socialist Republics is, virtually certainly, also conducting R&D in this area, the United States has a

strong incentive to understand what performance levels are actually achievable, and, consequently, a robust research effort within the treaty is recommended.

SUPPORTING TECHNOLOGIES

Let me go now to supporting technologies. There are six tasks which I will briefly describe in this catagory.

The first is midcourse discrimination technology and nuclear weapons effect research.

There are several means by which a defense might kill RV's in midcourse above the atmosphere. Most of these means seem potentially reasonable as components of military systems, provided their targets can be uniquely identified. But no one has yet solved the original problem which plagued the Nike Zeus project in the late 1950's, that is, how to tell real warheads from decoys and sensor noise. We should have a broadly based R&D program here. We also must find reasonable ways to simulate and analyze the effects on the environment of not only one but multiple nuclear weapons detonations.

Our ability to predict the effects of high altitude nuclear weapons effects is currently insufficient to permit confident assessment of the performance of virtually any BMD system.

There should be improvements in the warning and acquisition sensors. This is independent of whether we go ahead with defensive systems deployments. Our ability to have good warning and good sensors in space for assessing an attack is vital, independent of whether we have a defensive system, and should go ahead as a matter of extremely high priority in the judgment of the panel.

Regarding space survivability, we have to understand better survivability in space. These issues will be critical to understanding the feasibility of many of the advanced defensive weapons systems, and to understand possible threats to our intelligence, our warning, and our communications systems.

Fast burn boosters is a fourth category. Should the product of Soviet space defense research become capable of engaging U.S. ICBM's in boost phase or early midcourse, the United States should be prepared to respond with a timely and appropriate countermeasure, which is completion of the missile burn and the rapid deployment of warheads by the time they reach the top of the atmosphere. This work will also allow us to evaluate the effectiveness of Soviet countermeasures to boost phase defenses the United States might be considering.

Regarding battle management, the fifth category, this means how to acquire and handle enormous amounts of data from sensors, how to analyze the data, how to commit the appropriate system components to the response.

A multitiered nationwide defense will require improvements in technologies needed for battle management so great as to be appropriately characterized as revolutionary. Clearly we have to have a moderately sized program to define the requirements and to develop both hardware and software.

Sixth is the last category of work on defense against aircraft and cruise missiles. This work is needed so that a ballistic missile de-

fense system, if ever achieved, does not leave us totally vulnerable to threats within the atmosphere.

POLICY ASPECTS OF STRATEGIC DEFENSE

We also call attention to important policy aspects of strategic defense, beyond the straight technology ones, which require further study.

The first is transition to defense dominance.

If, in fact, strategic defense system effective enough to establish defense dominance is developed, is there a stable strategy for deploying it, one which does not lead to a high risk of inciting a nuclear strike during the transition period?

There is also the issue of a defense system as an adjunct to first strike. Does an effective or partially effective area defense inevitably create a potential first strike capability through the ability to suppress retaliation?

The third policy aspect is automation. Dr. Schlesinger said so correctly that we would be relying very heavily on automation. We should decide as a policy issue how high a degree of automation is acceptable.

Senator WARNER. Would you define what you mean by automation? Is that really turning it over to the computer?

Dr. DRELL. Yes, that means turning it over to the computer. Once the first button is pushed which says yes, go, there will be no time, particularly for a boost phase intercept, for human decisionmaking at that point. I think all agree to this. So the computer will have to be preprogrammed to manage the release of systems and to tailor the engagement.

Senator WARNER. We want to make it eminently clear that the strategic defense systems now proposed are nonnuclear, with the exception of using a nuclear power source for a laser.

Dr. DRELL. That's right. Absolutely right.

Senator WARNER. That should be made clear. And we are talking about automation only of the defensive part of our deterrent.

Dr. DRELL. Precisely right. It is automation both as a policy issue, but also in terms of when one will commit a system, depending upon whether one sees one or a few missiles rising, or many in a massive attack, and the strategy and tactics as a function of the character of the attack, which has to be decided very quickly. That area also especially needs automation, because predecisions will have to be made about deployment.

Vitality and responsiveness are two final recommendations. A program proceeding from research and development can and will remain vital and responsive to its objectives only if it is continually challenged to do so. Too often, in such programs as we are talking about the necessity of demonstrating a favorable cost exchange ratio against an opponent is either forgotten or conveniently kept well into the future.

To prevent this, the panel suggests creating two critical advisory bodies. The first is the so-called Red Team, or Devil's Advocate Team, to provide the offense analysis of countermeasures and to evaluate its own cost effectiveness in defeating the defense. This Red Team should have a charge independent of the management of

the defensive weapons R&D and should have a close contact for obvious reasons with intelligence agencies, in terms of what kinds of threats to think about.

The second suggestion of the panel——

Senator WARNER. Doctor, I wonder if I could interrupt for a moment.

Dr. DRELL. Yes, of course. I am just going fast because of time.

Senator WARNER. My problem is that they have sent for me to come to the floor for a brief period. Now I can come back, or possibly I can get another Senator to return.

Are you nearing the conclusion of your remarks?

Dr. DRELL. I have about one page to go, about 1 minute to go, that is all.

Senator WARNER. Please continue.

Dr. DRELL. Thank you.

The second suggestion is the creation of a senior level, independent, oversight panel to examine work on defensive R&D and report at a very high level. There should be experts, former officials in the government, someone like my predecessor witness today, Dr. Schlesinger, is what I obviously have in mind, which should insure that the work remains in close harmony with U.S. overall strategic goals and policies, particularly arms control goals.

We consider the opportunity cost of this program being proposed to be quite low, since its total cost is not likely to be very different from the sum of the amounts which were spent on its various components in the recent past.

This R&D is specified to be fully consistent with the ABM Treaty and poses no threat to the Soviet deterrent forces or to the fundamental basis of the United States-Soviet strategic relationship. After all, the Soviets are carrying out a similar program already.

The U.S. effort, with proper planning, explanation, and diplomacy should not create a problem of Soviet perceptions either vis-a-vis strategic or arms control stability.

If I might step for 1 minute beyond the report, let me say that my final line, my personal recommendation is the following: One, reaffirm our commitment to the ABM Treaty; two, organize a prudent, deliberate and high quality research program as outlined in the workshop report; three, recognize, as I stated, that at the present primitive state of many of the new technologies, it is far too early to undertake large-scale technology demonstrations which would be politically mischievous with regard to ABM Treaty compliance, as well as technologically unwarranted; four, form a Red Team, the countermeasures team; five, form a senior level independent oversight panel, as the workshop recommended.

My sixth recommendation, my personal recommendation, is for the Congress to enact legislation with the explicit provision that the research and technology program must proceed by means that are fully consistent with the ABM Treaty. The legislative record must make clear that this program in no way indicates a change in U.S. strategic policy. An appropriation of roughly $2 billion, as Dr. Schlesinger also said, is adequate for a strong research program that makes appropriate priority choices in developing new technologies.

Thank you, Senator.

Senator WARNER. Thank you.

COMPLYING WITH THE ABM TREATY

I have one question which I wonder if you might answer for the record. It draws on your last, and I think very important contribution, namely that we should proceed only in compliance with the ABM Treaty.

As a scientist, are you able to identify the language which would enable us to do the research and not enter into the testing phase? In other words, is there a clarity of delineation between research and testing so that we do not, should we say, unintentionally overstep the bounds of the ABM Treaty?

Dr. DRELL. There will never be a totally clean line. There will always be an area of discussion—what is a component, as opposed to what is an adjunct. A component being field tested is forbidden by article 5 of the ABM Treaty. Adjuncts or sensors as technology that are not components of military systems, those things we can.

I think there will always be judgment calls. But I feel, with the proper funding profile for a research program that does not have the extras that allow you to go and venture off into large technology demonstrations which will be, above all, technologically harmful to the program—they will generate cost overruns, they will begin to freeze engineering designs before we have the best ideas in mind—this can be handled.

I would be wrong if I said there is a simple answer. A research program leading to a development in a laboratory which you cannot monitor externally, can go ahead. It is when you go out to the prottype stage, with field testing or something like that, that you are clearly in violation of the treaty. In between it takes judgment, and not a law of nature. The oversight panel is important here.

Senator WARNER. Doctor, we thank you. I particularly want to say on behalf of the Chair and the members of the subcommittee that we recognize that you are from the private sector and that this has been a contribution of your own private time and perhaps there has been a little of your own pocket economics involved. But it is a worthwhile cause, and we greatly thank you.

Your testimony will be considered very carefully by the members of the subcommittee and the committee as a whole. Indeed, it will be made available to the Senate as a whole in this very important area.

[The Stanford Center for International Security and Arms Control Workshop report follows:]

Report of a Workshop at the Stanford Center for International Security and Arms Control

Strategic Missile Defense: Necessities, Prospects, and Dangers in the Near Term

(Final Draft, March 13, 1985: Sidney D. Drell, John A. Ernest, Philip J. Farley, John S. Foster, Jr., Richard L. Garwin, Sidney N. Graybeal, Thomas Johnson, John W. Lewis, Wolfgang K. H. Panofsky, Theodore A. Postol, Condoleezza Rice, Malvin A. Ruderman, George C. Smith)

I. Introduction and executive summary

On October 30, 1984, a workshop was held at the Stanford Center for International Security and Arms Control to examine near-term prospects for and alternative approaches to strategic defense. This report provides the results of that examination, and thus represents the consensus of the signatories on a limited set of high-priority objectives in strategic defense.

An earlier study by the Center [1] gave a critical assessment of the President's Strategic Defense Initiative (SDI). One of its recommendations was an unspecified, treaty-consistent research and development (R&D) program in anti-ballistic missile (ABM) defense at "a level not very different from recent amounts." Such an effort is also proposed herein, so the present report may in that one sense be seen as a logical complement to the 1984 study. But not all of the members of this workshop endorse all of the conclusions of that study. Also, the present report is limited to what ABM research and development we should be doing in the near term (5–10 years).

A more comprehensive view of this examination and the findings it has produced is gained by considering the activity of the workshop in the broad context of current issues in strategic defense. That context comprises a great diversity of views and activities: The Department of Defense is formulating programs to expand defensive weapons R&D in response to a charge from the President. There have been extensive criticisms of the emerging Strategic Defense Initiative, on the one hand from those who would accelerate it toward early deployment and on the other hand from those who would reduce it even below the 1984 levels of expenditure on relevant technologies. At the same time, the ABM Treaty itself has been threatened by serious claims and counter-claims of violations, and by erosion caused by advancing technology.

In sum, a convolution of disparate forces has brought the U.S. to the threshold of major changes, both political and technical, in the context of strategic defense and arms control that has evolved since the signing of the ABM Treaty in 1972. This circumstance may not call for major changes in U.S. national security policy. But it does suggest that the U.S. carefully examine what actions it certainly should be taking now and in the near future (5–10 years) to enhance its security and to reinforce stability in the context of current US and Soviet nuclear arsenals and international competition, and their likely trends. That is the issue the workshop considered, and which this report addresses.

This workshop explicitly avoided any critique, interpretation or analysis of the ongoing effort to realize the President's Strategic Defense Initiative.[2] In fact, the membership of the workshop included people holding a wide range of views with regard to the SDI itself, from strong supporters of the emerging program to those who believe the entire concept misconceived.

II. General context

We start by stating four major assumptions about the political and military situation of the next ten to twenty years. These assumptions will establish the context for defining necessary work in strategic defense during the next decade.

1. There will be no fundamental or drastic change in the relationship between the US and the USSR.

2. The strategic military balance will continue to be predicated on nuclear deterrence, which in turn is predicated on the dominance of offensive nuclear weapons. A consequence of this is that entire societies will continue to be vulnerable.

3. The SALT I ABM Treaty will continue to prove valuable for structuring US and Soviet forces on a stable deterrent basis.

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[1] Sidney D. Drell, Philip J. Farley, and David Holloway, *The Reagan Strategic Defense Initiative: A Technical, Political, and Arms Control Assessment* (Stanford: Center for International Security and Arms Control 1984).

[2] Thus, neither similarities nor differences in work discussed here and the SDI should be taken to imply either direct criticism or endorsement of the SDI projects.

4. The current state of development of strategic defense weapons systems, and of many of the technologies necesary to the operation of any particular system design, is inadequate to the task of defending the entire United States against attack by strategic nuclear weapons. Large-scale R&D projects might bring some individual systems or key components to the requisite performance capabilities by the turn of the century or later. The prospects of achieving a fully effective, operating nationwide ballistic missile defense are highly conjectural.

In Section III, we propose a specific set of R&D objectives in strategic defense and closely related technologies. We proceed in section IV to describe the elements of a program to meet those objectives and satisfy them at reasonable cost. Section IV also contains brief discussions of the issues of systems and military effectiveness, and of the ability of offensive forces to deployment of defenses. In Section V, we discuss briefly the broader security implications of the recommendations made in Section IV.

III. Mission

We now assert five objectives for near-term defensive weapons R&D. None of them requires deployment of defensive weaponry, although one of these objectives, as will be seen below, does imply some possible changes in deployment of offensive forces.

The objectives are:

1. Discourage the USSR from a "breakout" in defensive weapons.—Breaking out means, in the customary lexicon, rapid development of large numbers of defenses which, either by their technical characteristics or their numbers, violate the current terms of the ABM Treaty. A breakout would be undertaken with the intent of providing vastly more effective defenses either for national command and military targets or for both military and urban/industrial targets. It is largely immaterial whether the breakout is initiated without advance warning, and so violates the Treaty, or is initiated after a six-month warning of withdrawal, thus not formally violating the terms of the Treaty. A Soviet breakout with very large numbers of interceptors and radars might raise doubts about the overall effectiveness of American strategic offensive weapons. This circumstance could undermine the strategic balance. Advanced U.S. technology and the real possibility of American countermeasures, possibly including a defensive deployment in response, could contribute to deterring the Soviets from Treaty withdrawal or rapid breakout.

2. Minimize the adverse effects of a Soviet ABM breakout.—The U.S. can rapidly adopt responsive measures if it identifies and prepares now, to the extent warranted by the military effectiveness of various possible Soviet breakouts, the most cost-effective means of dealing with a breakout. The means might or might not include an American deployment of extensive defensive weaponry; they would certainly include countermeasures by U.S. offensive forces to maintain their deterrent effectiveness and to defeat the Soviet defenses.

3. Protect against military or technological surprises harmful to U.S. security.—It is of great importance to U.S. security to protect ourselves against technological surprises resulting from major advances in the technologies of either offensive or defensive weapons, or of both. This can only be accomplished by maintaining our own healthy R&D enterprise in the relevant areas.

Experience has shown that intelligence assessments of an adversary's technological capabilities can lead to highly misleading conclusions if they are based exclusively on information gathering and inference. A strong R&D enterprise in defensive technology, which can supplement such intelligence efforts, would provide a solid base for evaluating intelligence information and would greatly reduce the likelihood of a potentially very costly technological surprise. Such an effort is generally inexpensive compared to weapons acquisitions. Since the state of technology applied to strategic defense and its counters seems to be changing rather more rapidly now than at any time since the Second World War, it is imperative that the U.S. understand and have the ability to foresee those changes at least as well as the Soviet Union, and to integrate them into its military and diplomatic planning, including arms control policy and goals.

It is vital for the U.S. to maintain a high capability to identify and evaluate Soviet ballistic missile defense (BMD) activities and technological improvements, in particular, so as neither to underestimate nor exaggerate Soviet progress in defense technology. A case of immediate significance and expressed public concern is the growing capability of Soviet air defenses and anti-tactical ballistic missile (ATBM) defenses to provide terminal defense against strategic missiles, particularly those of shorter ranges.

4. Identify areas of technology or development which should be de-emphasized or terminated.—We will certainly find in the course of research and development that

certain system concepts, or the entire technological approach on which they are based, have little eventual utility, either because they turn out not to be feasible at requisite scale; because they cannot achieve system effectiveness or cost effectiveness criteria; because they are too vulnerable or otherwise too easily susceptible to countermeasures; because they have adverse ramifications (for example, they are politically or militarily destabilizing); or because there are better alternative security approaches. A number of technological approaches have already been found wanting in utility, yet development on some of them still proceeds.

The U.S. may also wish to cancel or at least defer programs in certain areas because of the mischief those programs work with prospects for achieving essential goals in arms control. An immediate area of concern in this category would be demonstrations of technologies which violate the ABM Treaty, or which rely upon and hence pejoratively stress ambiguities in compliance with Treaty provisions. A case for going ahead with any such demonstrations could only be made by establishing that their benefits would clearly exceed the potential damage to U.S. national security if the ABM Treaty were terminated.

5. Provide options for limited stabilizing defenses.—It remains possible that the United States may wish to deploy limited strategic defenses for specific purposes in the future, either within the limitations of the existing ABM Treaty or by attempting to renegotiate with the USSR some few modifications of the specific limitations. The most obvious possibility in this category is terminal defense of hardened ICBM silos and launch control facilities against ballistic missile reentry vehicles. Other possibilities, which currently look less likely because of their limited utility, great sensitivity to countermeasures or potentially high cost, include ballistic missile defenses of other military targets, nationwide defense against an accidental launch of one or of a very small number of warheads, and defenses against cruise missiles and aircraft. Research will enable the US to assess the potential value of such deployments, and development of functional prototypes will enable the US to move ahead expeditiously if cost-effective options have been found and if national needs have been established.

One further purpose which requires vigorous R&D efforts in the strategic defense field is, of course, to help answer the President's request for us to determine if it is possible to render nuclear weapons "impotent and obsolete." No one knows how to do this now, nor how to maintain strategic stability en route to such an admirable goal, but the possibilities should continue to be explored.

The R&D effort in strategic defense cannot be considered in isolation from other U.S. military programs. The direct linkage to offensive force effectiveness is implied in objective 2 above: it is very difficult to maintain confidence in our ability to penetrate any proliferated Soviet BMD system (especially one employing better technology than the current Moscow defense) unless we maintain a ballistic missile defense test facility with evolving state-of-art technology against which to test our reentry vehicles and their penetration aids. Furthermore, it would be inconsistent not to reexamine as well the possibilities for defense against air-breathing delivery systems at the same time R&D proceeds on defense against ballistic missiles.

We emphasize the importance of designing and executing the defensive weapons R&D program in ways (within the ABM Treaty) that maintain the range of technological options without, directly or de facto, committing the US to developing or deploying systems which could be destabilizing and hence harmful to its national security. Neither must it give rise to the logical presumption that the U.S. is committing itself to a defensive weapons breakout.

IV. Means

In this section, we discuss strategic defense activities which would develop, in a manner consistent with the national objectives elucidated in the preceding section, the means to achieve effective defense options and countermeasures in the near term.

The requirements for an effective military system obviously go far beyond demonstrations of the technical feasibility of its components. The system faces major challenges of integration and reliability, to say nothing of coping with countermeasures, even primitive countermeasures (that is, those which the adversary can employ with little lead-time and with no major changes in his own arsenal, simply by changing his tactics). With strategic defense weapons systems, integration and reliability are particularly pressing questions because the systems tend to be highly complex, the data-handling requirements enormous, the engineering tolerances very small, the time intervals extremely short, and the reliability required remarkably high.

The first task in determining the means to accomplish the strategic missile defense mission is to identify the critical technologies that would be required to imple-

ment various candidate systems concepts, and to determine what levels of performance would be required in each application. The workshop concluded that it is now far too early for any program in strategic defense to consider technology demonstrations of types that could raise serious issues of compliance with the ABM Treaty. Almost all of those few technologies that do appear to be ready for such demonstrations are not forbidden by the Treaty.[3] Field testing of some more difficult technologies, such as directed energy weapons systems, upon which various proposed defenses (especially boost-phase defenses) would rely, would clearly be forbidden. Since these technologies still require many orders of magnitude of development before they could meet minimum system criteria, it would be foolish to plan field demonstrations of them in the near future.

In addition to the political costs of such early demonstrations (whether or not they violate the ABM Treaty), premature promotion to the demonstration-and-test phase can be very harmful to attainment of any particular goal in strategic defense. A considerable body of evidence has shown that early demonstrations of new technologies have two deleterious effects: First, they tend to freeze the technology being demonstrated before it is fully mature, and thus guarantee less than full capability. Second, they tend to absorb money from the associated R&D program (because of cost overruns), and thus eliminate the possibility of better solutions. In a problem such as boost-phase defense, in which the most promising technologies have the farthest to go, this means that early demonstrations may effectively eliminate any chance of success. Thus, at this time, sensible R&D should proceed. But demonstrations (in space or against targets) of types that could justify charges of ABM Treaty violation should not even be considered before the new technologies reach sufficiently advanced performance goals to merit tests of their ability to meet systems criteria.

In response to the objectives stated above, we have considered work in three categories: (1) So-called "conventional" or "traditional" ballistic missile defense; which we take to mean the nuclear-armed interceptor rockets and radars originally envisioned and considered explicitly by the ABM Treaty; (2) Directed Energy, that is, laser and particle beam weapons; and (3) Supporting Technologies, those which are necessary for advanced systems integration and for support of missions closely related to BMD.

Here is a description of the work we recommend in each of these three categories:

Conventional ballistic missile defense

Conventional BMD is currently the only candidate system of strategic defense which is based upon tested integration of proven system components. Thus, the threat of a US deployment of conventional BMD is credible and could be instrumental in deterring a Soviet breakout. Similarly, the existence of tested military capability makes conventional BMD instrumental in minimizing the adverse effects of a Soviet breakout on the strategic balance. Thus, an option to deploy or to threaten deployment of such a system must occupy a central role in any strategic defense planning.

The principal goals at work in this category are (a) to develop and maintain on an R&D basis an evolving, state-of-art conventional system; and (b) to develop and test penetration aids against that system to maintain the effectiveness of the U.S. offensive deterrent. These two goals must be addressed as a joint effort. Together, they represent one of our major recommendations: development and operation at Kwajalein Island of a test facility incorporating a single, integrated but evolving conventional terminal defense system (a "functional prototype"), and advanced offensive penetration aids (pen-aids). Within certain broad limits, the provisions of the ABM Treaty permit development and testing of fixed, land-based systems components relevant to these goals. There are four separate tasks to meet the goals:

(1) Prototype terminal defense system.—The U.S. currently has no benchmarked terminal defense system; the USSR has deployed a BMD system around Moscow and upgraded it (within Treaty limits) twice since the signing of the (ABM) Treaty. Thus, the Soviet system is not only fully benchmarked, it implies the existence of production lines. Even if U.S. technology is superior in the critical areas (missile, radar and computer performance and cost) of conventional BMD, the asymmetry in this state of affairs undermines U.S. efforts to strengthen Treaty compliance: The Soviets may at some time perceive, correctly or incorrectly, an important military advantage to a breakout in which they can have sole possession of a proliferated defense for a period of years. This consideration becomes more serious as technology

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[3] Examples are: sensor acquisition studies; low-power pointing and tracking experiments; large-scale integration of small mirror elements; atmospheric compensation experiments.

improves and makes the defenses more effective. It would become particularly serious if future arms control successes were to result in major reductions in offensive strategic arms, and thereby greatly increase the leverage of defense. So to meet our first objective—maintenance of a strong incentive to Treaty compliance—it is important to develop a functionally prototyped system of interceptors, radars, computers and communications.

The dominant reason, however, for constructing and operating a functional prototype defense arises from the second objective—minimizing the adverse effects of a Soviet breakout. There are two components to meeting this objective. First, the critical element of a U.S. response to a Soviet breakout is deployment of penetration aids on U.S. ballistic missiles. But a program to develop and modernize penetration aids cannot succeed and provide confidence without a working and modernized BMD test facility against which to test them. Second, if the Russians do elect to break out and proliferate defenses, it is not clear to what extent the U.S. would wish to respond by deploying and proliferating its own BMD. It is doubtful, however, that the U.S. response would be completely limited to the enhancement of offensive systems, even if the U.S. were confident in the ability of its forces to negate Soviet defenses with pen-aids. So in order to have the option of defense deployment (at whatever scale) available, the U.S. should develop a state-of-art functional prototype, which would allow an expeditious counter-deployment in the event of a Soviet breakout.

Finally, the availability of a capability for terminal defense meets the fifth objective—provide options for limited, stabilizing defense. One particular possibility in this category might arise if in the future the U.S. and the Soviet Union were to decide jointly to permit expanded hardsite defense to address the problem of ICBM vulnerability. In such a case, the only way, based upon what we are now capable of both technologically and militarily, that such an option would be available to the United States would be through a conventional BMD system.

Of course, such a deployment, if it were concluded to be strategically advantageous, would require renegotiating some terms of the ABM Treaty—at least the provisions governing numbers of interceptors and radars, and probably mobility and deception as well. Members of the workshop differ on the relative weight of risks in reopening negotiations on the Treaty and potential benefits of reducing ICBM vulnerability; consequently, it is not a recommendation of the members that this course be explicitly considered. If further defensive proliferations could be convincingly prevented, dedicated hardsite ICBM defense could be stabilizing to the nuclear balance. However, two important technical issues would certainly have to be settled before any change to the ABM Treaty could be considered to be an attractive policy option guaranteeing that hardsite deployments could be unambiguously defined and verified as hardsite and not area defenses; and demonstrating that the hardsite defense enjoyed a strong, favorable cost-effective ratio against increases in numbers of Soviet reentry vehicles (RVs) and in their penetration capabilities. Many members believe that explicit prohibitions on increases in offensive weapons would also be necessary.

(2) Penetration aid development program and test program.—Pen-aid development was allowed to wither almost out of existence during the last decade. Because this failure violates both the objectives of deterring breakout and of minimizing its impact, we strongly recommend the vigorous resuscitation of the pen-aids development and test program. The U.S. must be capable of determining the effectiveness of various signature suppression, simulation, and anti-simulation techniques against a diversity of possible defensive sensors.

(3) Studies and development for advanced system.—This element actually comprises two tasks in the upgrading of conventional BMD, again to meet the first, second and fifth objectives. First, a functionally prototyped system should be continually upgraded to keep pace with advances in component technologies. This task should include research on mobile and deceptive components (note that development and testing must be strictly limited under the ABM Treaty); development of more capable interceptors, including faster, more agile ones, and ones with homing capability; sensor improvements to defeat pen-aids; sensor survivability studies, and optional technology improvement in general; and development of more capable, more suvivable, cheaper radars and computers.

Second, R&D should continue on defensive concepts from the category usually referred to as "simple-novel"—concepts which generally try to avoid the advanced technology and complex system requirements of conventional BMD systems. One idea from this category that has particular appeal to many workshop members is the so-called "dust defense," in which buried nuclear explosives cast up large quantities of fragmented rock in the paths of incoming RVs. Adding an element of dust defense could, for instance, greatly reduce the vulnerability of a conventional inter-

ceptor defense to attacks in which large numbers of attacking RVs arrive practically simultaneously (attacks with high threat rates).

A future systems concept which has received considerable attention lately is known variously as non-nuclear kill (NNK) or kinetic energy weapons (KEW); generically both these terms mean projectiles which home on RVs and strike them. This hit-to-kill approach has been proposed for systems in the atmosphere, and has actually begun testing for mid-course intercept in space (the Homing Overlay Experiment). Performance requirements for endoatmospheric NNK are considerably more stressing than those of conventional nuclear systems in the same engagement areas; it requires terminal homing and faces the fundamental difficulty of requiring discrimination at higher altitudes. Hence, it does not qualify in the "simple-novel" category. Consequently, we do not recommend a strong development effort in this area. Some research on this approach should be maintained because of the potential political advantages enjoyed by an NNK system if the greater technical difficulties could be overcome. Exoatmospheric KEW, however, is a different matter. The critical technical limitation on such a system is not in the interceptor but in the area of decoy discrimination; this task is included among Supporting Technologies below.

(4) ATBM studies.—At the time of the ABM Treaty, the US successfully argued for exclusion of ATBMs from limitation by the Treaty. Part of the U.S. motivation was the intent that the PATRIOT air defense system (then called SAM-D), then several years in development and presumably not far from deployment, would have a significant ATBM capability; the Russians did not appear to have an equivalently advanced counterpart. Now, twelve years later, PATRIOT has had difficulties meeting its air defense specifications and is not formally considered an ATBM. Meanwhile, the USSR is on the threshold of deploying a purportedly capable ATBM, the SA-12. The United States should respond with two steps. First, it should review its strategic offensive systems and consider radar cross-section reduction and modest pen-aids for its RVs. Second, the U.S. should reconsider the question of the direct military value of an ATBM. Several possible courses of action should be examined if an ATBM is found to have significant military value. Among these options are: first, that a separate ATBM system be developed, either from scratch or from adaptation of components taken from existing systems (including PATRIOT); and second, that the U.S. seek an effective arms-control ban on ATBMs.

Directed energy

This category comprises three tasks, which we call laser technology, X-ray lasers, and exotic concepts.

Research on directed energy killers is essential to protection against technological surprises, and can contribute to deterrence of a Soviet breakout, since maintenance by the U.S. of strong technologies in this area helps fuel uncertainty in the USSR as to the type and effectiveness of an American response to a Soviet breakout. Directed energy sensors and discrimination techniques may also eventually contribute to minimizing the impact of a Soviet breakout and to provisions of stabilizing defenses. Of course, directed energy R&D must also meet our fourth objective—identifying technologies with insufficient capabilities.

Directed energy research has received the gaudiest and most extensive press coverage of all defensive weapon technologies, and has inspired a broad range of strong views. However, several members of the workshop have extensive expertise in this field, and they achieved a remarkable consensus on the relative merits of the various technology components almost from the outset. We present that consensus with a minumum amount of explanation of the criteria of choice. The reader who disagrees violently with the inclusion or exclusion of a particular technology should bear in mind that the relative priorities assigned within the directed energy category are a matter of distinctly secondary importance to the overall schema presented in this report. The primary results of the workshop are the assignment of overall priorities within a reasonable level of effort, and the emphasis on near-term, achievable military and arms-control goals.

(1) Laser technology.—Perhaps the most controversial of the workshop's choices is to eliminate infrared (IR) lasers from consideration as BMD weapons. Chemical IR lasers have been proposed for pre-deployment in space to accomplish boost-phase kill of ICBM's. Such deployment would add a number of considerable disadvantages: the need for very costly redundancy in order to maintain laser satellites on station at all times; the high cost of vast energy stores in space; and, above all, vulnerability to direct attack by a number of means at highly favorable cost exchange ratios to the offense. We believe that these factors make such laser battle stations in space completely impractical. Hence, for laser weaponry, our recommendation is to con-

centrate work on increasing the capabilities of ultraviolet (UV)/visible lasers, particularly ground based.

Other principal elements of laser technology R&D in the BMD context are: adaptive optics for atmospheric compensation of the laser signal; large-diameter, diffraction-limited mirrors; efficient, reliable power supplies and switching; transmission through induced atmospheric disturbances; and acquisition, pointing, tracking and kill assessment sensors and optics meeting stringent criteria. Low-power lasers may play roles in this last element, and may be based anywhere and employ a variety of wavelengths, including IR.

Research in these fields could have significant utility in civilian as well as military applications outside BMD, and should proceed vigorously. High-energy ground-based lasers will certainly provide some military capability in antisatellite weaponry. We recommend below that the ramifications of this prospect be considered fully (see under Space Survivability in the following category, supporting technologies).

(2) X-ray lasers.—Nuclear-driven x-ray lasers present a defensive weapons technology with some potential for employment in support of offensive operations as well. Currently there is very great uncertainty in performance levels that can be reached or maintained against countermeasures. If the moderately high brightness levels which have been discussed [1] are achieved, X-ray lasers could be used as ASAT weapons; it is possible that they might be integrated into offensive weapons systems for suppression of retaliatory ICBM launches following a first strike. If very high brightness levels are achieved, X-ray lasers could be the basis of a potentially effective deffensive layer. Since the USSR is, virtually certainly, also conducting R&D in this area, the U.S. has a strong incentive to understand what performance levels are actually achievable. Consequently a robust research program within Treaty limits is recommended here as well.[4]

(3) Exotic Systems.—In this category, we place particle-beam weapons of all types and decoy discrimination techniques which employ particle-beam weapons. All of these are well behind lasers in terms of demonstrated performance levels, engineering of components and related systems, and design of a credible military system. We also include in this task free electron lasers, since their demonstrated performance is quite primitive. Our recommendation is that this entire task, as is appropriate to the high-risk component of any research program, be allocated about 5–10% of the total funds in the directed energy category.

Supporting technologies

This category comprises six tasks with somewhat disparate purposes.

(1) Mid-course discrimination technology and nuclear weapons effects research.—There are several means, including nuclear weapons in various deployment modes and non-nuclear hit-to-kill projectiles (such as the one tested in the Homing Overlay Experiment), by which the defense might kill RV's in mid-course. Most of these means seem potentially reasonable as components of military systems, provided their targets can be uniquely identified. But no one has yet solved the original problem which plagued the Nike Zeus project in the late 1950's—how to tell the real RVs from decoys and sensor noise. There are currently numerous suggestions for solving the discrimination problem with both active and passive optics of various descriptions, and with more exotic means such as high energy particle beams and specially designed nuclear weapons.

If Soviet understanding of the mid-course discrimination problem were to improve and US understanding of this problem did not, potentially dangerous instabilities could occur (for example, if the U.S. were not prepared to or did not know how to counter future Soviet discrimination techniques). As things stand now, the US has no well-defined and diversified set of programs to increase its understanding in this most important area of uncertainty. The U.S. should be conducting a broadly-based R&D program to evaluate plausible mid-course discrimination techniques. Since actually intercepting and killing the RVs seems credible only if one can deal with countermeasures, it is necessary to investigate all promising schemes for mid-course discrimination against the range of plausible methods of denying the defense observables or discriminants (maskers, jammers, decoys, anti-simulation, tactical measures).

It is also necessary to find a reasonable way to simulate and analyze the effects of an environment containing multiple nuclear weapon detonations. In fact, no one really knows what the physical characteristics of such an environment would be: order-of-magnitude uncertainties abound in critical factors such as electron density

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[4] This recommendation is not posed as an argument against future changes in the Threshold Test Ban Treaty.

and radiation flux density as a function of wavelength. Study of the effects of high altitude nuclear weapons detonations is another research area which has been poorly supported during the last decade. Our ability to predict the effects of high-altitude nuclear weapons effects is currently insufficient to permit confident assessment of the performance of virtually any BMD system. We strongly recommend that this area of research be resuscitated [5] in support of both discrimination R&D and pen-aid development.

(2) Improvements in warning and acquisition sensors.—The array of radar and/or optical sensors on which the defense relies for immediate warning of an attack and a quick analysis of the size of the threat (attack assessment) must be accurate and highly reliable. Independent of defensive weapon programs, a constant improvement of sensor quality and survivability is vital and should be a matter of extremely high priority. In addition, the U.S. should complement existing methods with sensors working on different principles; it should do what it can to protect the satellites from direct attack, and to harden them against long-range nuclear weapons effects; and it should proliferate them.

Beyond warning and threat assessment, however, considerable additional sensor performance is required for any multi-tier BMD system: the sensors must have the sensitivity to acquire individual targets, the precision to track both boosters of plausible methods of denying the defense observables or discriminants (maskers, jammers, decoys, anti-simulation, tactical measures).

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Beyond warning and threat assessment, however, considerable additional sensor performance is required for any multi-tier BMD system: the sensors must have the sensitivity to acquire individual targets, the precision to track both boosters and RVs and the ability to judge the success of the defense's attack; and they must be capable of doing so in severe nuclear environments.

The problem of nuclear environments is perhaps not so severe for satellite-borne as for airplane-borne tracking, but the effectiveness of precursor bursts to confuse or blind even satellite sensors remains beyond present capacity to calculate with confidence, far less test.

Thus vigorous programs of sensor R&D and survivability enhancement and of improving the understanding of nuclear environments should proceed regardless of BMD research and development.

(3) Space Survivability.—A broad research effort should be undertaken to examine the survivability of all space-based assets to a full range of credible threats. An understanding of space survivability issues will, of course, be critical to understanding the feasibility of many advanced defensive weapon systems, and to understanding possible threats to intelligence, warning and communications systems. Two specific possibilities must be addressed within the framework of such an effort: space mines and antisatellite (ASAT) systems.

Space mines—long-lived satellites containing either conventional or nuclear explosives, which can maneuver within range of other satellites to kill them—provide a simple, inexpensive response to hostile deployment of space-based weaponry. As in

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[5] This is not to suggest a resumption of atmospheric nuclear testing.
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other cases, conventional explosives have the virtues of greater political acceptability and adherence to Outer Space Treaty, while nuclear explosives have the virtue of considerably easing performance requirements, in this case requirements on tracking the target satellite and maneuvering close to it. Some members of the workshop express concern at the full development of even conventionally-armed space mines, especially until firm national and arms-control policies concerning all ASATs are developed. All agree, however, that space mines should be studied carefully, particularly as responses to space-based BMD, with any technical and systems issues being clearly defined and bounded, and with the ramifications of deployment in various arms-control scenarios well delineated.

With regard to the relationship between ASAT and BMD, there are two cases, the converse of one another: the effect of ASAT R&D upon BMD technology evolution, and the effect of BMD R&D upon ASAT technology evolution. In the latter case, we are agreed: any comprehensive program of R&D for area defenses will also be addressing most of the critical issues in ASAT development. In simple terms, an exoatmospheric BMD capability implies an ASAT capability; since BMD is a much more difficult task, partially effective missile defenses may prove to be very effective low altitude ASATs. As to the former case, however, we have not arrived at a consensus view.

The extent to which R&D on and any deployments of ASAT weapons and BMD are actually coupled must be examined further and clarified. Because of the linkage between ASAT and BMD, the interactions between arms control efforts and weapons development contain many areas still open to conjecture, particularly those relating to verification. The question, then, must be asked both ways: How do ASAT development and deployment affect U.S. national goals with respect to BMD? And how do BMD development and potential deployments affect U.S. national goals with respect to ASAT?

(4) Fast burn boosters.—Should the product of Soviet space defense research become capable of engaging U.S. ICBMs in boost-phase or mid-course, the U.S. should be prepared to respond with appropriate and timely countermeasures. A potentially straightforward countermeasure to a great variety of boost-phase attacks could be the employment of fast-burn boosters. Because their fuel burns out so rapidly and at altitudes which are quite low relative to today's boosters, such boosters could become very difficult to engage during their boost phases. Additional denial of engagement capability might also be achieved by more rapid deployment of RVs and decoys from the missile immediately following the boost phase. Consequently, we recommend a modest development program to evaluate fast-burn boosters and rapid RV deployments. This work will also allow evaluation of the effectiveness of such a Soviet countermeasure to boost-phase defenses we might be interested in. We do not recommend full-scale development and testing, but we do recommend establishing an R&D base to provide that capability; in the lexicon of the Department of Defense, we are proposing a continuing program of 6.2 and 6.3a development.

(5) Battle management.—Any large and complex defensive system will need to be able to acquire and handle enormous amounts of data from sensors, to analyze the data rapidly, and to commit the appropriate system components to the engagement. This demanding set of data-handling and logic tasks is referred to as "battle management." A multi-tiered nationwide defense will require improvements in technologies needed for battle management so great as to be appropriately characterized as revolutionary. A moderately-sized program to define requirements and to develop both hardware and software for this challenging control problem is clearly required. Eventually it should be possible to establish firm objective criteria for systems complexity, which in turn would permit proposed schemes to be judged against one another, and perhaps some minimum standards to be set.

(6) Aircraft and cruise missile defense.—The U.S. should expand studies into feasibility and desirability of installing defenses against air-breathing weapons because the technological prospects have been changing rapidly. This work is needed as a matter of balance. Otherwise, if the U.S. were actually to succeed in providing nationwide ICBM defense, it would be in the embarassing position of having a defense against the currently most numerous and threatening carriers of nuclear weapons but no defense at all against the others.

Further studies

In addition to the six tasks of supporting technologies just described, there are several policy aspects of strategic defense which require further intensive study. Four important issues to address are:

(1) Transition to defense dominance. If in fact a strategic defense system effective enough to establish defense dominance is developed, is there a stable strategy for

deploying it—one which does not lead to a high risk of inciting a nuclear strike during the transition period?

(2) First-strike adjunct. Does an effective or partially effective area defense inevitably create a potential first strike capability through ability to suppress retaliation? How does this implicit risk scale with the effectiveness of the defense, and does it lead inevitably to instability? What is the role of air-breathing forces?

(3) Automation. How high a degree of automation will be required of the prospective strategic defense? What precisely are the acceptable limits of automation? This issue is particularly pressing for boost-phase defenses.

(4) Allied deterrents. Our allies have expressed fears that US and Soviet nationwide defenses would undermine the effectiveness of their own deterrents and the validity of NATO strategy, perhaps leading to a decoupling of Europe as a conflict zone. To what extent are these fears justified? Can any such effects be mitigated?

Vitality and responsiveness

A program proceeding from research to development can and will remain vital and responsive to its objectives only if it is continually challenged to do so. Too often in such programs the necessity of demonstrating favorable cost-exchange ratios against opponents is forgotten or conveniently kep well in the future.

To prevent this, we suggest the establishment of two critical advisory bodies. The first is a Red Team to provide the offense analysis and countermeasures and to evaluate its own cost effectiveness in defeating the defense. This Red Team should have charter independent of the management of defensive weapons R&D. A close connection should be established between the Red Team and the intelligence agencies, to their mutual benefit. The Red Team will thus receive more realistic and detailed accounts of Soviet capabilities; the intelligence community will be assisted in focusing its efforts on our needs for intelligence on what the USSR is doing both in defensive and offensive countermeasures.

The second suggestion is the constitution of a senior-level, independent oversight panel which examines work on defensive R&D and reports at a very high level in the Administration. The panel should comprise both experts in the various technological and military specialties and former public officials in defense and arms control matters. This panel should maintain knowledge of the technical and programmatic status of work on defensive weapons that is sufficiently detailed for the panel to advise the government on the setting of priorities. It should also conduct periodic reviews of the R&D to ensure that the work remains in close harmony with U.S. overall strategic (both military and arms control) goals and policies.

V. Ramifications

The R&D activities we have recommended directly enhance national security through accomplishment of the first three objectives discussed in Section III: deterrence of Soviet ABM breakout; minimizing the effects of such a breakout; and protection against technological surprises. That is, R&D gives the Soviets a solid incentive for observing the ABM Treaty, and provides the option of a comparable capability if they break out of the treaty, either using currently available technology or something new.

The opportunity cost of this work is quite low, since its total cost is not likely to be very different from the sum of amounts which were spent on its various components in the recent past. Those programs were able to compete successfully for funds with other military development programs then, even though they did not possess particularly high priorities, either in the Services or in the Department of Defense. Thus, they did not represent a high opportunity cost to other kinds of pressing endeavors.

The R&D proposed here is specified to be fully consistent with the provisions of the ABM Treaty, and so poses no threat to the Soviet deterrent forces or to the fundamental basis of the U.S.-Soviet strategic relationship. The USSR is already carrying out similar broad advanced defensive R&D, and in contrast with the U.S. is actually engaged in prototyping and deploying conventional terminal BMD defenses. A deliberately paced U.S. research effort on strategic defense that is organized and prosecuted with clearly stated goals and means, and that abides by the ABM Treaty, should serve our security well at reasonable cost and should give the USSR no reason to feel the need for additional offensive or defensive forces. Apart from real incentives, incentives which arise entirely from fears and perceptions must be dealt with. A U.S. effort with proper planning, explanation and diplomacy should not create a problem of Soviet perceptions vis-a-vis strategic or ams control stability.

The impact of such clearly defined and constrained activities on the ABM Treaty should be nil in the near and mid-terms. Success in persuasively creating a new approach to effective national defense would indeed present a challenge to the Treaty.

If this should occur, it would do so well into the future, and regardless of which side succeeded. In such an eventuality, we should have to resolve and negotitate a new arms control policy, one that would successfully integrate offensive and defensive forces.

An important function of the high-level oversight panel that we advocated in Section IV is to assure that priority attention will be given on a continuing basis to the broad effects of the R&D program on US national security and arms control objectives.

[From the Los Angeles Times, March 10, 1985]

PRUDENCE AND THE 'STAR WARS' EFFORT—RESEARCH, WITHIN BOUNDS OF ABM TREATY, CAN AID SAFER WORLD

(By Sidney D. Drell)

President Reagan's Strategic Defense Initiative (SDI) will cast a long shadow across the negotiating table when the United States and the Soviet Union resume formal arms-control talks in Geneva on Tuesday. Important as it is for these talks, and as much as it has been discussed in public, the SDI—or, as it is popularly known, "Star Wars"—is still very early in its planning, and its form and development are far from clear.

Some of the SDI supporters emphasize its technical promise to provide a total nationwide defense of people and cities—a promise that at present we have no idea how to achieve. Others advocate a more modest goal of providing a limited defense of military targets and missiles in order to enhance deterrence.

Both the rhetoric and the implementation of the SDI will certainly affect the course of the Geneva talks. In particular I find it hard to imagine that it will be possible to achieve reductions in offensive forces, as called for by President Reagan, if the SDI leads to a major and rapid buildup of defense programs that clearly are headed beyond research toward actual deployment.

On the contrary, we can expect a buildup of offensive weapons as a counter to such a program, much as the United States responded to initial deployment of Soviet anti-ballistic missile systems in the 1960s by developing and deploying MIRVs, missiles with multiple precisely aimed warheads. Facing the prospect of having to penetrate a defense system, won't the Soviets be reluctant to reduce the very large throw-weight of their ICBMS? That throw-weight will be of even greater value to them, since they can add many more warheads and "penetration aids" to their present missile force with no new construction.

We can avoid these problems and improve our prospects for success in the Geneva negotiations—and at the same time meet our national security needs—with the following six actions:

Reaffirm our commitment to the ABM Treaty of 1972. It defines the common premises of the U.S.-Soviet effort to avoid nuclear war and to achieve arms reductions, and thus serves our national security goals.

Organize and support a prudent, deliberate and high-quality research program on defensive technology within ABM Treaty limits. The availability of such technology, together with the real possibility of American countermeasures, cancontribute to discouraging the Soviets from deploying defensive systems in violation of the treaty, minimizing adverse effects of such a potential Soviet "breakout" if it should occur, and protecting us against technological surprises.

One aspect of the U.S. research program should be to maintain a strong technology effort in what is commonly called conventional ballistic-missile defense, that is, ground-based interceptor missiles armed with nuclear warheads and command-guided by radar. Research on this technology is allowed within very broad limits under the terms of the ABM Treaty. And it is needed in order to provide us with an option to respond expeditiously should Soviet actions lead us to conclude that a limited defense of hardened military targets would be stabilizing for the strategic balance. It is the only technology that we now have available for such an option. I disagree with its being downgraded in the current SDI program, which is focusing on much more difficult and far-out technologies.

Recognize that, at the present primitive state of many of the new technologies, it is far too early for us to undertake large technology demonstrations. Such demonstrations (for example, in directed-energy weapons) would be politically mischievous with regard to ABM Treaty compliance. They also are technologically unwarranted and very likely will lead to cost overruns and to an emphasis on engineering designs that would be far from optional.

Form a strong "red team"—that is, a team of devil's advocates—to challenge the defense program concepts against potential Soviet countermeasures. Any deployed defensive system will have to be effective against a determined opponent who can resort to a wide variety of countermeasures in order to defeat, deny, evade, destroy or otherwise overpower the system.

Enact legislation in Congress with the explicit provision that the research and technology program must proceed by all means that are fully consistent with the ABM Treaty. An appropriation of roughly $2 billion per year is adequate for a strong research program that makes appropriate priority choices in developing new technologies.

Form a senior-level, independent oversight panel of experts and former public officials in defense and arms-control matters. This panel should advise the government at the highest levels on the setting of priorities. It should also conduct periodic reviews of the program to ensure that the work remains in close harmony with our overall strategic (both military and arms-control) goals and policies.

Finally, it is important for us all to recognize that the path to a safer world cannot be paved by technology alone. This path will have to be paved initially and for a large part of the way by progress in diplomacy and arms control. Strategic defenses can aid our quest for a safer world only if they are pursued within an arms-control framework that limits further weapons buildups and countermeasures.

Senator WARNER. Dr. Drell, we thank you and have a safe trip home.

Dr. DRELL. Thank you, Senator.

Senator WARNER. The subcommittee is adjourned.

[Whereupon, at 11:24 a.m., the subcommittee adjourned, to reconvene upon the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1986

WEDNESDAY, MARCH 20, 1985

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC AND
THEATER NUCLEAR FORCES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

MILITARY SPACE PROGRAMS INCLUDING ASAT

The subcommittee met in open session, pursuant to notice, at 9:08 a.m., in room SR-222, Russell Senate Office Building, Senator John W. Warner (chairman) presiding.

Present: Senators Warner, Cohen, Quayle, Nunn, Hart, Exon, and Glenn.

Staff present: Arnold L. Punaro, staff director for the minority; Christine C. Dauth, chief clerk; Robert E. Bayer, Robert F. Bott, William E. Hoehn, Jr., and George K. Johnson, professional staff members; Russell C. Miller and Patricia L. Watson, research assistants.

Also present: Romie L. Brownlee, assistant to Senator Warner; James M. Bodner, assistant to Senator Cohen; Henry D. Sokolski, assistant to Senator Quayle; Allan Cameron, assistant to Senator Denton; Janne E. Nolan, assistant to Senator Hart; Jeffrey B. Subko, assistant to Senator Exon; and Phillip P. Upschulte, assistant to Senator Glenn.

OPENING STATEMENT BY SENATOR JOHN W. WARNER, CHAIRMAN

Senator WARNER. The subcommittee will come to order.

The subcommittee convenes in open session to receive testimony on the U.S. military space programs in review of the fiscal year 1986 Department of Defense authorization request.

In past years, the programs under discussion today have been reviewed in the context of their mission areas, particularly command, control, and communications.

With the growing dependence of the United States on space assets, with the growing share of the budget that is associated with space payloads and the means to get them into orbit, and with the growing attention to the military utilities of space and to space arms control, it was the judgment of the Chair that the subcommittee should have a hearing dedicated to this purpose.

I am pleased to welcome as our witnesses today Brig. Gen. Donald Kutyna, U.S. Air Force, Director of Space Systems and Command, Control and Communications, Headquarters, U.S. Air Force; Maj. Gen. Carl Beer, Deputy Chief of Staff for Plans, Air Force Space Command, in Colorado Springs; Maj. Gen. Thomas Brandt from the Joint Planning Staff for Space in the Organization of the Joint Chiefs of Staff; Commodore Richard Truly, U.S. Navy, Commander, Naval Space Command—and no stranger to space himself, having been a shuttle astronaut—and Rear Adm. William Ramsey, Director of the Navy Space Systems Division in the Office of the Chief of Naval Operations.

The militarization of space did not begin with the launch of the first classified payload from the space shuttle several months ago. Both we and the Soviets depend upon important space assets for communication and warning purposes.

I believe it is more important that the public understand the role of space to the maintenance of peace and to the more stable world that we all seek. I, therefore, would like as much of today's hearing as possible to be open to the public so that there might be a better awareness of the scope and the nature of the U.S. military space program.

It is the intent of the Chair to go into closed session whenever that is necessary to protect classified information. The Chair understands that this will be necessary to discuss details of the space defense or Asat program, as well as to receive a briefing on steps being taken to improve the survivability of our vital space assets.

Gentlemen, the subcommittee has received statements from Commodore Truly and from General Beer and General Kutyna, and in the interest of time, I would ask you to submit those for the record.

We will begin our open session with Commodore Truly, and then proceed to presentations by General Beer and General Kutyna. General Brandt is available to answer any questions members might have concerning the establishment of a Unified Space Command.

STATEMENT OF COMMODORE RICHARD H. TRULY, U.S. NAVY, COMMANDER, NAVAL SPACE COMMAND (FORMER SPACE SHUTTLE ASTRONAUT)

Commodore TRULY. Good morning, Mr. Chairman.

Mr. Chairman, I am very pleased and also proud as Commander of Naval Space Command to be here to testify to the subcommittee this morning and to be the first person to testify about the Naval Space Command in this context.

I would propose with your concurrence that I submit my prepared statement for the record and give a short oral summary about the Naval Space Command and its relationship to the Navy's role in space.

Senator WARNER. The full statement of Commodore Truly will be entered into the record.

Commodore TRULY. Thank you, sir.

As you know, Mr. Chairman, the naval forces of the United States, both the Navy and the Marine Corps are critically depend-

ent today on our space assets for support. This is true today and will be more true in the future.

The mission of the Naval Space Command is to be an operational focal point for the control and operation of Navy space-based assets and also to provide direct fleet support from those assets whether they be Navy controlled, Air Force controlled, or controlled from whatever source.

I have been asked by Admiral Watkins, the Chief of Naval Operations, to report to this subcommittee today on two important organizational changes that he has recommended and have been approved by the Secretary of the Navy, one in the area of space policy and one in the area of space-based research.

In order to elevate the space focus on the policy in the Office of the Chief of Naval Operations, his principal policy adviser on command and control, Vice Adm. Robert Kirksey, will become Director, Space, Command and Control.

In the area of space research, in order to increase the effectiveness of the Navy-sponsored research in space systems for the fleet, we have formed the Naval Space Technology Center to be located at the Naval Research Laboratory which will become the Navy's leading laboratory for space.

NAVAL SPACE COMMAND

If I may return to the organization of the Naval Space Command itself, we are small. We have a headquarters of about 72 people that is split essentially equally between military and civilian on the headquarters staff, and we are young. We have been in operation for 17 months, but I can assure you that we are in operation today.

The Naval Space Command is operational manager of the Navy's satellite communications systems which is a constellation of eight satellites that span the globe. We operate the Navy Navigation Satellite System Command through a subordinate command, the Navy Astronautics Group at Point Mugu, CA.

We operate an electronic fence for space surveillance and through another subordinate command, the Naval Space Surveillance Center at Dahlgren, VA, which reports operationally to the Commander-in-Chief of the North American Aerospace Defense Command.

Another mission of Naval Space Command is to provide information on fleet vulnerability to overhead satellites directly to units at sea.

We are also very heavily involved in exercise planning and analysis for our deployed forces.

This has been a busy several months for the Navy in space. In the last few months we have launched a new Transit satellite. We have launched two leased satellites—a communications satellite called Leasat—from the space shuttle. Just Monday before last we launched the Navy geodetic satellite and I am happy to report that each of the four of these new capabilities is in orbit, in operation and essentially operating perfectly.

As to the future of our command, for those Navy-sponsored satellite systems, we would become the logical operator of them.

The Navy continues to support our Nation's manned space program. As you know, I came to this job from several years with NASA immediately after commanding the eighth flight of the space shuttle, Challenger. I am pleased to tell you that Commodore-select Ken Mattingly, who flew to the Moon aboard Apollo 16 and has commanded two space shuttle missions, including the latest DOD flight, is detached from NASA and is in the local area now on Navy duty and will take over as Director of Space Programs at the Naval Electronics System Command.

We also flew a naval oceanographer on the space shuttle during the past several months, Paul Scully-Power from the Naval Underwater Systems Center in New London, to increase the Nation's knowledge of oceanography as viewed from space.

We have a significant people challenge in the Navy. One of the initiatives that we are pursuing in order to make sure we have the properly trained, educated and experienced people to solve this challenge, as we do in all areas of the Navy, is to try to make better use of the Naval Reserve.

I have argued for and we have had approved a small Naval Space Command Selected Reserve Unit, which was stood up on the 1st of October last year and has begun drilling.

I am pleased to tell you a third Navy astronaut, Capt. David Griggs of the U.S. Navy Reserve, is the commanding officer of that unit.

I will point out to you that the name of this command is the Naval Space Command, not Navy Space Command. We are very attuned to the U.S. Marine Corps' participation in the command. We have had Marine presence on the staff since the beginning and based on a recent agreement between the Chief of Naval Operations and General Kelly, the Commandant of the Marine Corps, I have in hand in Dahlgren a set of orders for a Marine colonel who will report later this spring as Deputy Commander of the Naval Space Command.

In summary, we believe space support for our deployed forces, both Navy and Marine Corps, is our life blood. We seek in the Navy to strike a very definite balance between the strategic uses of space and the maintenance of space support for our tactical forces wherever they may be.

We have put our house in order organizationally so that the Navy can continue to be effective in its use of space for our forces.

In conclusion, I would remind you that the mission of the Naval Space Command is an operational one to operate Navy systems and also to provide direct fleet support from space.

I will be pleased to answer any questions that you or the subcommittee members might have.

[The prepared statement of Commodore Truly follows:]

PREPARED STATEMENT OF COMMODORE RICHARD H. TRULY, U.S. NAVY, COMMANDER, NAVAL SPACE COMMAND

Mr. Chairman and members of the Committee. I welcome the opportunity to be here today to discuss the accomplishments and future plans of the Naval Space Command. The command was established 17 months ago and is fully operational, providing direct support to the fleet. I would like to discuss what the command is tasked to do, how we are organized to accomplish that tasking, what we have done since our establishment and what we plan to do in the future.

MISSION

Naval forces are forward deployed in peacetime, represent flexible options for rapid United States response to crises, and stand ready to execute a distant, offensive strategy in the event of war. All Navy and Marine Corps primary warfare areas depend upon space today for optimum mission effectiveness, and the criticality of space systems' support to specific missions varies widely. Further, our level of dependence upon space is growing, as is the number of space systems supporting us. As for the future, major advances in space capabilities are inevitable and will change the nature of naval warfare. As Admiral Watkins noted at the establishment of the Naval Space Command on 1 October 1983, "Because of the capabilities which space-based systems provide a Navy—SEA CONTROL now means SPACE CONTROL. The link is there—well forged and unbreakable."

The Naval Space Command is the focal point for the control and operation of space-based assets which support our naval forces throughout the world. The Navy-Marine Corps team is the principal *tactical* user among U.S. forces of space surveillance, environmental monitoring, communications and navigation systems. Our Command ensures that space based systems support to the fleet is reliable, rapid, coordinated and meets the needs of the operational user. Additionally we are looking to the future, seeking to define the ways in which we must evolve our space-based capabilities to remain viable well into the next century. Our goal is increasingly survivable systems which are affordable and allow for evolutionary enhancement.

COMMAND OPERATIONS

The Naval Space Command has consolidated disparate Navy space efforts into a coherent operational organization which directly supports our operating forces forward deployed throughout the world. This consolidation began upon etablishment of the Command in October 1983 with the assumption of authority over two Navy space field activities established in the 1960's, the Navy Astronautics Group and the Naval Space Surveillance System. Both of these activites have been and continue to be instrumental in facilitating the Navy's tactical use of space.

The Navy Astronautics Group (NAVASTROGRU), with headquarters at Point Mugu, California, provides control and operations for the Navy Navigation Satellite System (TRANSIT). It controls four tracking and control earth stations (Prospect Harbor, Maine; Rosemount, Minnesota; Port Mugu, California; Wahiawa, Hawaii) anda computational facility which support TRANSIT operations from lift-off at Vandenburg Air Force Base until the satellite's ultimate demise. Additionally, the Navy Astronautics Group provides frequent navigation updates and satellite telemetry, tracking, and control to maintain TRANSIT navigation accuracies. It has maintained a remarkable reliability record by succesfully completing 99.92% of all satellite navigation update attempts over the years.

TRANSIT, operational since 1964, was first conceived of as a system to support the precise navigation requirements of the Navy's Fleet ballistic missile submarines. It use was subsequently expanded to include all fleet units. In fact, TRANSIT has been so successful in its operations that in addition to providing navigation fixes to Navy ships, it is also used routinely by other government agencies, worldwide commercial interests and foreign governments. Normally, four satellites are maintained in orbit to provide the necessary frequency of precise navigation updates.

The second field activity under the control of the Naval Space Command is the Naval Space Surveillance System (NAVSPASUR), headquartered at Dahlgren, Virginia. NAVSPASUR maintains a constant surveillance of space out to approximately 7500 nautical miles, detects and identifies newly launched space objects, tracks all other objects, maintains a catalog of earth-orbiting satellites, and reports pertinent events of interest to the North American Aerospace Defense Command's (NORAD) Space Detection and Tracking System as well as to fleet units. Further supporting NORAD, NAVSPASUR became the Alternate NORAD Space Surveillance Center (ANSCC) during the fall of 1984. NAVSPASUR has a direct fleet support role including the reporting of time intervals during which ships at sea or Marines ashore will be vulnerable to satellite surveillance.

1 October 1984 marked the firt anniversary of the Naval Space Command and the expansion of its operations to include the operational control of Navy communication satellite systems. Among these systems are the Fleet Satellite Communications system (FLTSATCOM) which is DoD owned and operated, and GAPFILLER and LEASAT, which are leased from COMSAT General Corp. and Hughes respectively.

GAPFILLER is a communications satellite sytem which provides limited UHF communications over major oceanic areas of the Atlantic, Indian, and Pacific

Oceans and the Mediterranean Sea. It became operational in mid-1976 and is nearing end of life.

FLTSATCOM is a four-satellite communications system which provides primary UHF communications to naval forces deployed worldwide. It also serves as one of the host vehicles for the Strategic Air Force Satellite Communications System, AFSATCOM. FLTSAT-1 was launched in February 1978, and the system was completed by the launch of FLTSAT-4 in October 1980. Replenishment of this system is planned later in the 80's with the launch of FLTSAT-6, 7 and 8. FLTSAT-7 and -8 will each carry an Extremely High Frequency (EHF) communications package on board, which will provide a platform to allow early EHF terminal testing and limited operational capability at EHF frequencies.

LEASAT is a leased four satellite system which supplements FLTSATCOM and replaces GAPFILLER. LEASAT I and II are currently in operational fleet use following the first deployment of communication satellites for the Navy from the nation's Space Shuttle. LEASAT III and IV will be launched later this year.

Naval Space Command also coordinates Navy use of and requirements for the Defense Satellite Communications System with the Defense Communications Agency.

DIRECT FLEET SUPPORT

We consider our preeminent mission at Naval Space Command to be direct fleet support. This fleet support mission takes us directly into the naval operating environment with involvement in naval operations and exercises. Generally speaking, we see two major thrusts in our direct support mission.

The first is to assist the fleet in optimizing the space contribution to naval operations. This involves management and coordination of space operations, communications satellites, navigation and sensor systems as well as exploring methods for improving national systems support through such programs as Tactical Exploitations of National Capabilities (TENCAP). Under way are efforts to provide streamlined tasking, speedier information flow and improvements in our ability within the Navy, afloat and ashore, to assimilate and effectively utilize space-derived information.

The second thrust of our fleet support charter is to assist the fleet in minimizing the impact of Soviet surveillance upon U.S. naval operations. To do this we must understand both our own capabilities and vulnerabilities as well as those of the Soviets.

Our fleet support efforts for 1985 include participation in a major series of Pacific Fleet exercises, among them NORPAC 85 and RIMPAC 85. With the Atlantic Fleet we are in the planning stages leading to participation in Ocean Safari 85. By involving ourselves in exercises and operations such as these we can understand first-hand current fleet capabilities and limitations, increase fleet participants' understanding of space capabilities and limitations and better determine fleet requirements for new and improved systems.

Our involvement with the Fleet will help us to better manage the SLOW WALKER project and to implement other capabilities which use space-based sensors to provide timely indications and warning of threats to Naval forces throughout the world.

We see a great need to find ways to characterize, locate and eliminate sources of radio frequency inteference to our communications satellites, and we are working vigorously in concert with other services and agencies who share our concern in solving this pressing satellite problem. We are also trying to find ways, within existing naval SATCOM capabilities, to provide for increased utilization of the Fleet Imagery Support Terminal (FIST) in support of battle group requirements for current imagery while deployed.

We have found that in order for us to be effective in meeting fleet space needs, we need to dramatically increase the awareness within the Navy and Marine Corps of the present and future contribution of space systems to naval operations. This fleet awareness goal has had the direct and personal support of the Chief of Naval Operations. Among the initiatives under way to educate and train Naval personnel are the "Naval Space Short Course," a series of briefs on space systems and their applications to naval missions and the Tactical Exploitations of National Capabilities (TENCAP) Fleet Support Course. The "Short Course" can be tailored for use by various audiences, from the Fleet Commander-in-Chief and his staff to a deployed ship's company; the "TENCAP Course" is aimed at the operational (battle group) commander and his staff. Integration of the two into a single curriculum is a mid-range goal. We intend to continue to sponsor the effort but envision that it would be managed subsequently as part of the Navy's training and education system.

The Navy is challenged in providing qualified and trained personnel to fill vital and expanding space specialty mission areas. The Naval Space Command has started a program to make fleet personnel more knowledgeable in space operations while ensuring the existence of space-related educational programs at initial officer accession and graduate level sources. In support of this educational goal, we are sponsoring a new Space Research Chair in the Aerospace Engineering Department at the United States Naval Academy, and I am an active participant in curricula reviews for our graduate courses in space at the Naval Postgraduate School. We recognize the necessity to maintain a continuous flow of space qualified personnel throughout the Navy in order to support the Navy's growing use of space. The Navy has tapped a cadre of space experienced personnel by forming a Selected Reserve Unit at the Naval Space Command to utilize available expertise and provide a qualified base for mobilization. This reserve unit was established on 1 October 1984 and has begun drilling at the Naval Space Command.

FUTURE PLANS

With the advent of the Naval Space Command as an operational overseer of space operations, the Command has developed procedures for new space operational capabilities in order to ensure effective and coordinated fleet introduction. An example of the effectiveness of these procedures was the recent smooth transition to operational utilization of the Hughes leased communication satellite system (LEASAT).

Looking into the future, the command is expected to assume operational responsibility for Navy's Geodesy Satellite (GEOSAT); the Relocatable Over-the-Horizon Radar system (ROTHR); and the Navy Remote Ocean Sensing System (N-ROSS).

GEOSAT, which was launched just two weeks ago, will first be employed to collect sufficient data to model the earth's geoid more accurately than it has ever done in the past. This information will allow a significant reduction in the sea-launched ballistic missile error budget. The Naval Space Command will be involved with monitoring the operations and data collection management to ensure that the program fully satisfies mission objectives. Upon completion of its primary mission, the Command will assume responsibility to operate the satellite for environmental support missions.

The Relocatable Over-the-Horizon Radar (ROTHR) system is a high frequency radar under development to provide wide-area ocean surveillance for selected areas worldwide. It will be relocatable to prepared sites to support naval forces globally, and will be capable of meeting Navy's air and surface surveillance requirements within its access area.

The Navy-Remote Ocean Sensing System (N-ROSS), a satellite program, is under development to produce the essential oceanographic and environmental data in support of all mission warfare areas, and to aid in the safe passage of vessels on the high seas. We have important planning functions to perform, and future operational activities for this satellite capability.

A systematic approach to identifying and tracking future naval space requirements has been initiated. This long-range planning approach will monitor and affect the programming and budgeting processes to ensure that an integrated architecture evolves in a manner consistent with the threat, opportunities, technology, survivability and affordability. Within that architecture, several systems have already been identified, either proposed or under development, which will have a substantial impact upon naval warfare.

Of major significance to the integrated architecture I mentioned earlier is the Military Strategic Tactical and Relay Satellite Communication System (MILSTAR), being designed to provide worldwide minimum essential communications in a wartime environment. The Air Force is the MILSTAR executive agent, Navy has terminal development lead, and the Naval Space Command is today heavily involved in Navy operational planning of this important program.

The NAVSTAR Global Positioning System, for which the Air Force is executive agent, will eventually replace TRANSIT navigation for the fleet and upgrade the Navy's capability to navigate on, under, and above the ocean's surface. The Navy has been involved in the program from its inception and is developing the very stable time standards for the satellites as well as participating in platform terminal development.

CONCLUSION

Space is having a profound impact on naval strategy and indeed, on warfare in general. Service strategies are becoming increasingly intertwined as space continues to offer new avenues of combined warfare to friend and foe alike. In carrying out

our maritime mission, we have sought a Navy policy for the exploitation of space resources which integrates use of Department of Defense and national assets with space systems utilized for unique naval missions. We in the Navy and Marine Corps realize the key to the most advantageous use of space based assets is through coordinated, efficient interservice and interagency planning and operations. As a matter of Navy policy in this regard, Admiral Hayward's statement of several years ago remains true today; ". . . the United States Navy is not seeking to carve out for itself a major competitive role in space . . . we do not seek to duplicate current efforts by others . . . we DO seek to capitalize on every bit of ongoing effort that can be applied to meet Navy requirements . . . there is a valid Navy interest in space . . . by working together with all agencies likewise involved, we will all be better off and our nation more secure."

The Naval Space Command is the centerpiece of Navy-Marine Corps operational efforts to provide adequate planning and tactical support to deployed naval forces while also working with other service and agency space components in the development and maintenance of coherent national and DoD space policy planning.

The overriding message I have emphasized today is that the Navy is putting its house in order in regard to its space efforts. The Naval Space Command is a major step in that direction. In the short time we have been in existence I am more convinced than I was before that our effort has high payback in more effective control of space assets for naval forces. Our focus provides for better fleet support and more effective naval interface with sister services and other government agencies. As a closing thought, I would like to quote Admiral Watkins once again . . . "Today—and increasingly tomorrow—a seafaring nation also must be a spacefaring nation."

Thank you.

Senator WARNER. Thank you, Commodore.

I note you have quite a distinguished record yourself.

Commodore TRULY. Thank you, sir.

Senator WARNER. You seem to be ably qualified to take on your new responsibilities.

Senator Nunn or Senator Glenn, do you have any observations?

Senator NUNN. I will pass to Senator Glenn, Mr. Chairman.

Senator GLENN. I don't have an opening statement. I am sorry I am late getting here.

Certainly we don't have anyone better qualified to lead this command than Dick is. I am glad to have his testimony here.

Do you want to get into questions about the overall system integration between them and the Air Force?

Senator WARNER. I think it would be well advised to wait on that question.

Senator GLENN. So that you may be thinking about it, I am concerned that we are not setting up duplicate systems here, very expensive. We know that this feeds into Norad and the Air Force Space Command and that there is coordination between that and the Naval Space Command. I wonder whether we are duplicating things that should even be split off from both and put under one separate command or whether we are better advised to continue the way we are.

My questions will be along those lines a bit later.

Senator WARNER. Now we will hear from General Beer.

STATEMENT OF MAJ. GEN. CARL N. BEER, DEPUTY CHIEF OF STAFF FOR PLANS, AIR FORCE SPACE COMMAND, COLORADO SPRINGS, CO

General BEER. If I may introduce Brig. Gen. Donald Kutyna on my left who is Director of Space Systems and Command, Control and Communications, and to his left is Maj. Gen. Thomas Brandt who is from the Joint Chiefs of Staff. He is the head of what is

called JPSS, the Joint Planning Staff for Space. He is here to answer questions relative to formation of the Unified Space Command.

I will present along with General Kutyna, a joint statement we have prepared which we would like to enter into the record.

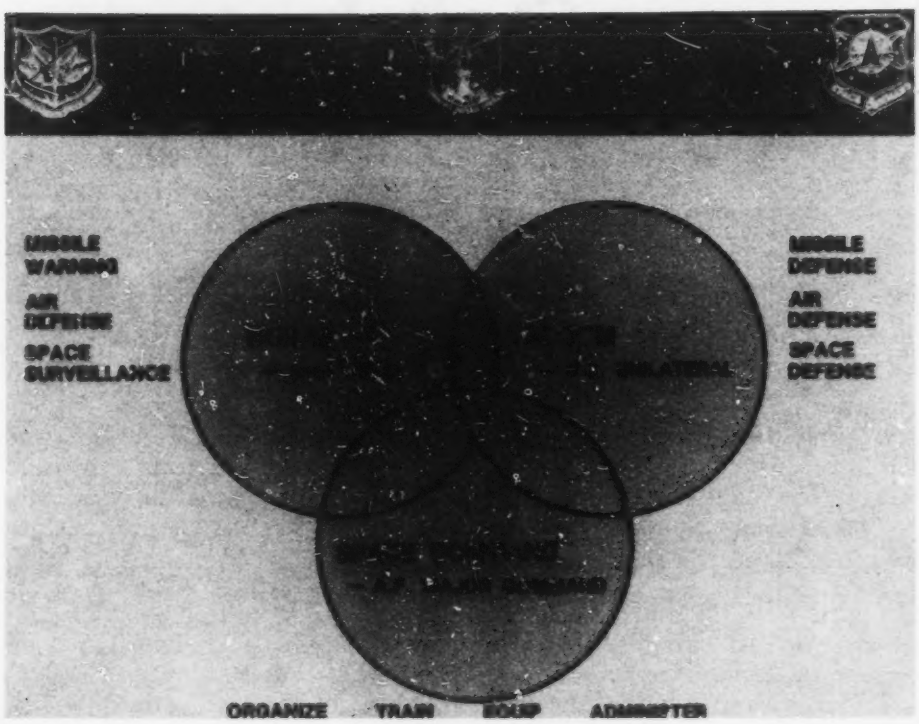
Senator WARNER. Without objection.

General BEER. I have some Vu-Graphs I will speak to.

AIR FORCE COMMAND UPDATE

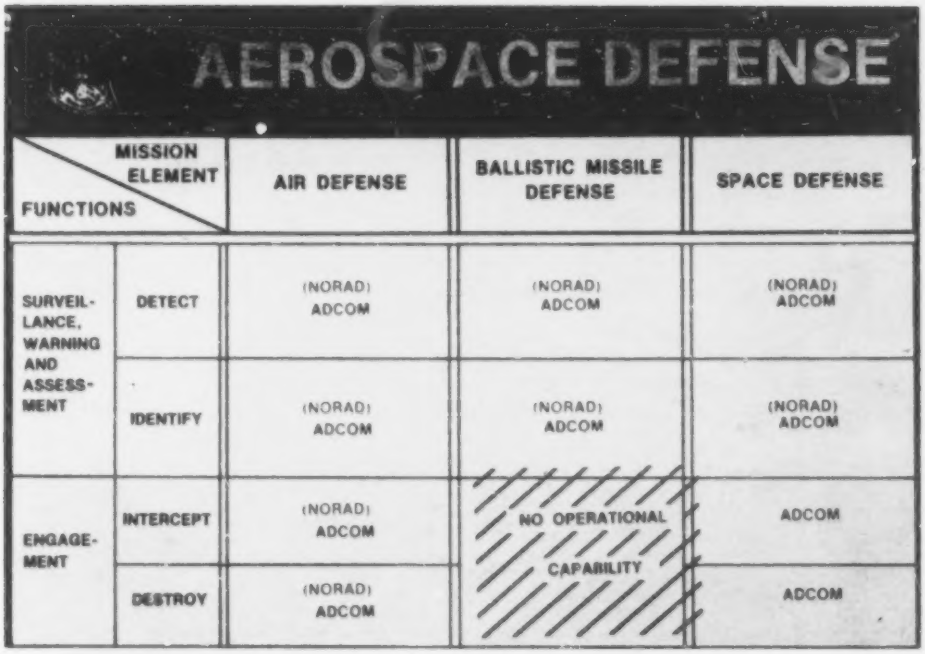
General BEER. As the title implies, this is an update on the Air Force Space Command in Colorado Springs established on September 1, 1982.

Sir, before speaking to the Space Command, let me talk briefly about what the missions are in Colorado Springs that we have there by national command with joint participation of Canadians.



These are the Norad missions. Adcom is the U.S. component to Norad and has these kinds of missions. There is a broader mission responsibility for Adcom than Norad.

The Air Force Space Command provides resources to both of those, Norad and Adcom, and has organization, training, and equippage responsibilities.



A scorecard on how well we feel we can accomplish the three missions of aerospace defense. These are the traditional four functions, detection, identification, intercept and destroy. You can break it into two categories. Let us call this detection and this engagement.

In air defense we have very limited capability, mostly due to the fact that we don't have any atmospheric early warning coverage today. The over-the-horizon radar will help rectify this situation. We feel we are about to enter a period when we have some capability.

We are better off in tracking atmospheric targets with the operation of AWACS and interceptors. For the destruction part of that we are not so capable. The Soviet cruise missile threat has been growing, which gives us a lot of difficulty in that role.

Turning to missile defense, in the detection and surveillance role, we are pretty satisfied with the capabilities we have there: the BMEWS System, PAVE PAWS System, the SEWS System in combination with the upgrades. We are all funded.

You know there is no operational capability today for doing an actual ballistic missile defense.

In space we feel in the detection category we have significant capability. We have upgrades to those space surveillance and sensors. Our capability is a little more modest when it comes to the identification because we don't have deep space capability for doing space object identification.

In terms of engagement in space capability, it seems very limited. The only reason we color it yellow is because we do have an F-15 Asat research and development program.

SPACE COMMAND

OVERVIEW

Why a space command?
What the command looks like.
What we're doing

Turning now to Space Command, these are the three things that I will speak to you for a couple minutes on why we formed it and then focus on some of the things that we are engaged in.

WHY A SPACE COMMAND

Soviet threat.
Increasing dependence.
Resource commitment.
Shuttle.
Space policy.

These are the five reasons that led the Air Force leadership to make the decision to form the operational command.

The first, of course, is the growing Soviet space threat. In general, the Soviets are doing all they can in space. By most estimates there are $3- to $5-billion more annually spent on military space programs by the Soviets than ourselves.

They have the only operational space weapon system. They have in development today a space plane, space shuttle and two new boosters, one of which has a very heavy lift capability.

Increasing dependence on space refers to those traditional functions of surveillance, communications, and so on. That dependence has existed for a long time. That dependence is growing at an increasing rate.

Resource commitment has increased from over $2- to $3-billion in 1975, to our $10 billion in 1985. So, we needed an organization to manage that level of commitment.

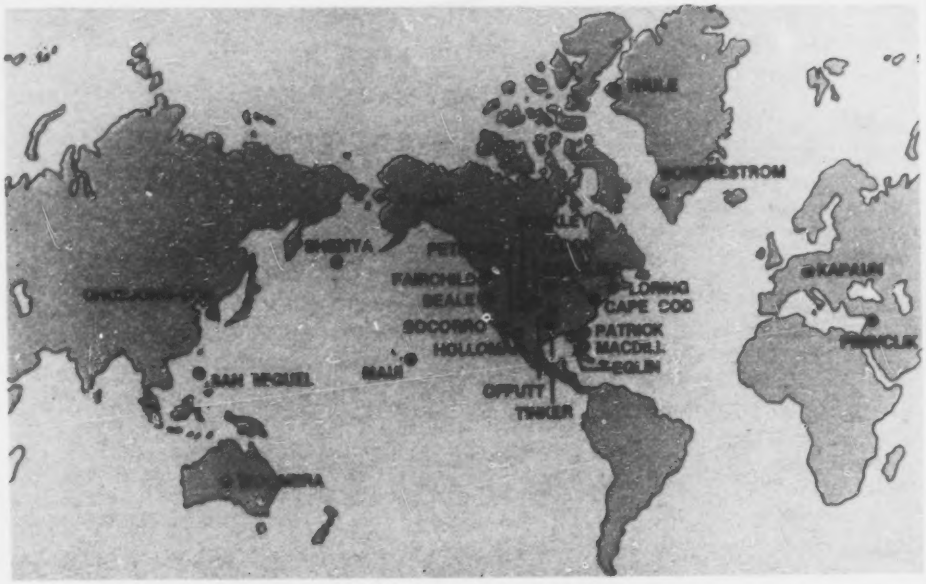
The shuttle has two aspects to it, the first being the shuttle will soon be our primary access to space.

The second part being a DOD-NASA agreement.

DOD is committed to flight planning and flight control.

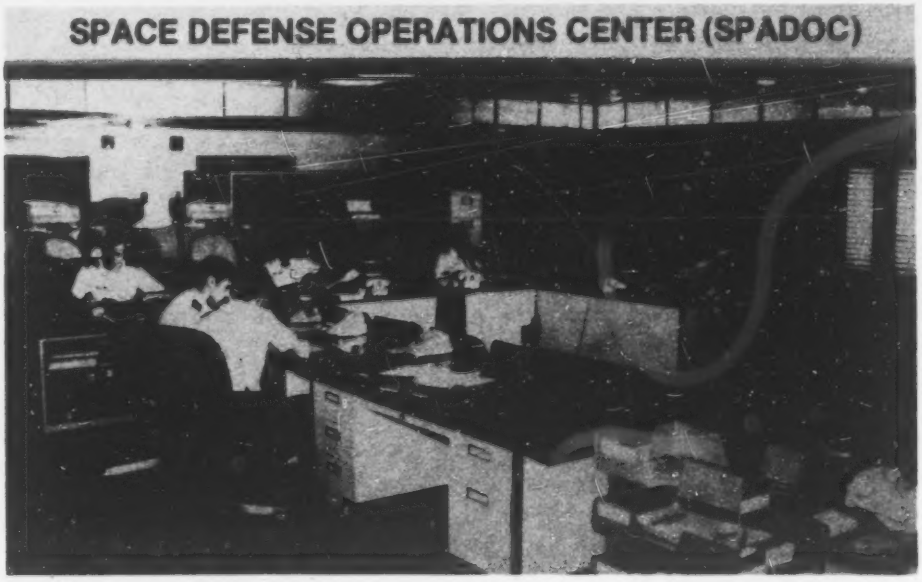
Finally, the fifth reason is space policy and that refers to an announcement of July 1982 when our national space policy called for a space program in which the first priority was to strengthen national security.

Those are the five reasons that Air Force formed an operational command in space.



Briefly on what the command looks like. I have two charts. The focus will be on the space role that Space Command will accomplish. These are the worldwide locations. Sensors in the new Space Command that extend from Thule to Australia, from Korea to Turkey.

It is a farflung network, primarily for space surveillance. These sites are doing space surveillance to accomplish 25,000 observations each day. Those 25,000 observations are funneled into this center at Cheyenne Mountain called the Space Defense Operations Center.



There are a number of observations required to maintain the space catalog. There are over 4,500 objects in space today. The catalog is provided to the United Nations and the free world.

Senator WARNER. Are those functional objects?

General BEER. No, sir. Active payloads are less than 10 percent.

STATEMENT OF MAJ. GEN. THOMAS C. BRANDT, JOINT PLANNING STAFF FOR SPACE, ORGANIZATION OF THE JOINT CHIEFS OF STAFF

General BRANDT. There are on the order of 300 active functioning satellites.

Senator WARNER. You said something about 4,500.

General BEER. 4,500 objects in space. There is a lot of space debris.

Senator WARNER. That is the question I posed. There are 4,500 objects in space.

General BEER. Yes.

Senator WARNER. Of which there are on the order of——

General BRANDT. There are on the order of 300 active functioning satellites.

Senator GLENN. We have 4,200 pieces of space junk.

Senator WARNER. Did you leave any in space?

Senator GLENN. I came back, a two-way trip.

Dick left more than I did up there.

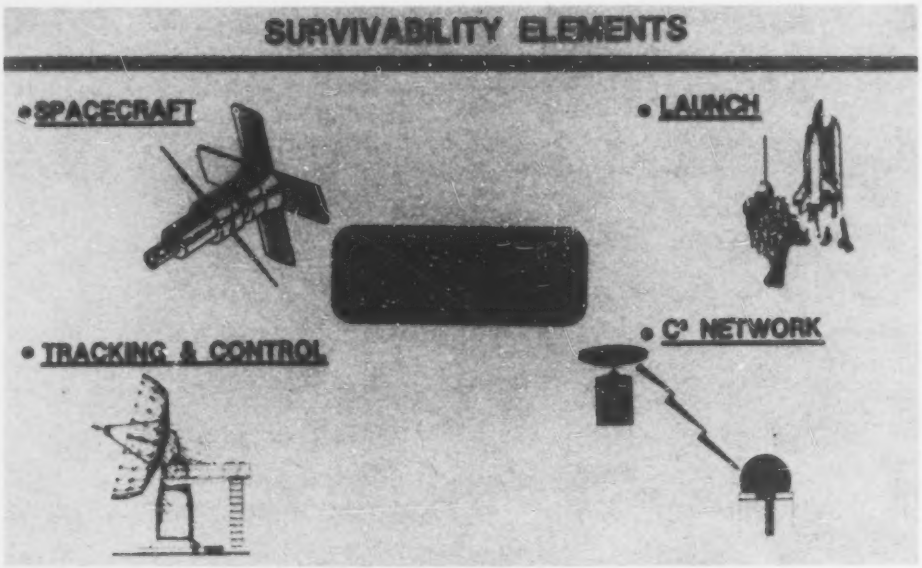
General BEER. This Space Defense Operations Center is in the process of being automated today. It monitors the health and welfare states of all U.S. payloads on orbit, which includes civil and commercial.

In addition, this center provides threat assessment against those payloads in orbit. There is an advisory responsibility to advise the owner/operators of those threats. Threat assessment of that nature will also be provided to the new Space Defense Operations Center.

SELECTED ACCOMPLISHMENTS

Survivability.
Technology review outcome.
SDA 2000.
Air Force space plan.

Turning now to some of the things we have accomplished, some of the things we are doing, I will address brief comments to each of those four.



Now, the subject of the closed session is primarily survivability i.e., what are we doing about the lack of survivability?

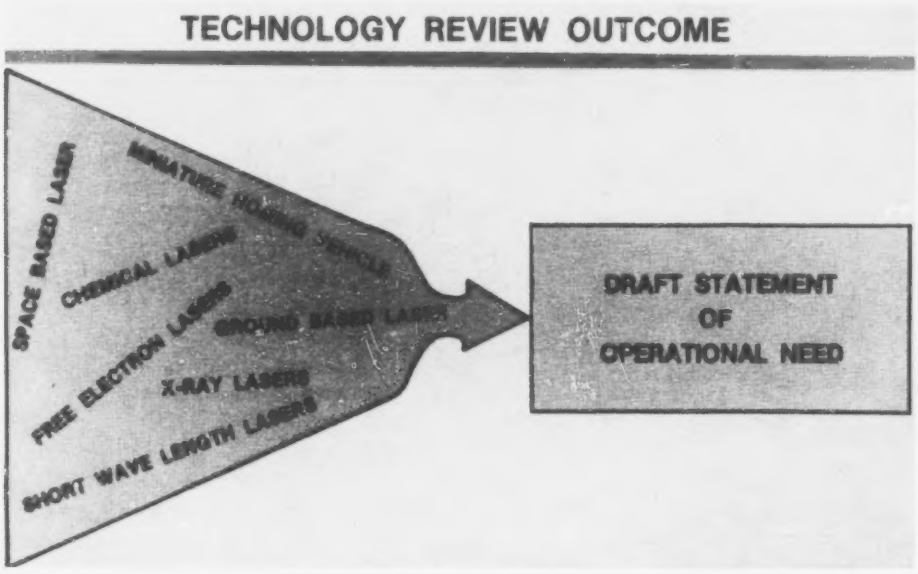
This is called the Space Systems Architecture Study. Suffice it to say here, when the new Space Command was formed, we recognized that many systems on orbit today need improvements in survivability. When the new command gets the support needed, we are going to have to show commanders, the warfighters and CINC's worldwide, that they can rely on their space assets being there during crises and conflict.

So, the new Space Command took on the responsibility of doing something about improving the survivability of our space track network and payloads on orbit.

In addition to on orbit, as you can see, there are three other key elements of the space system. The interdependence of the space segment and ground segment includes command and control and user links and launch facilities that make up the system that we have to address with survivability.

We have had Air Force money redirected in both the 1984 and 1985 budget years to fund some essential survivability enhancement.

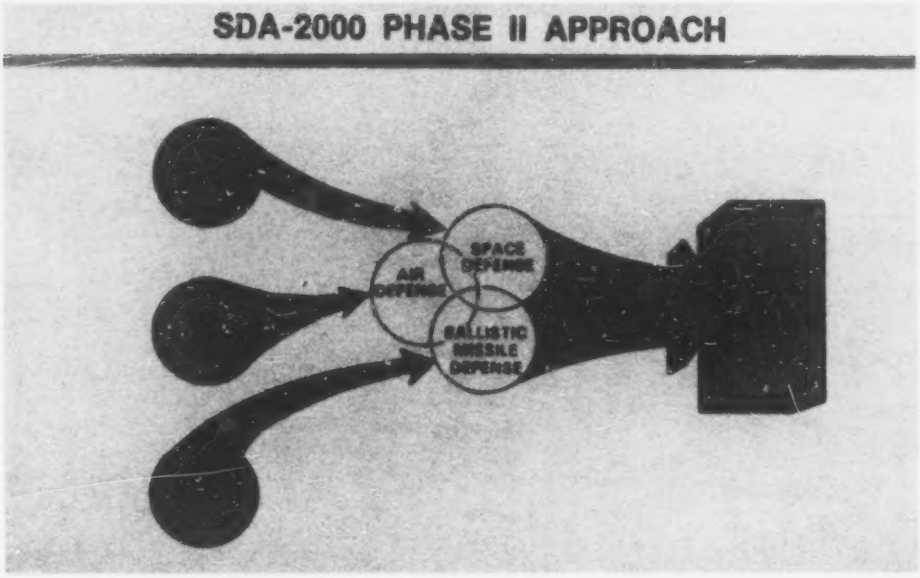
This is sort of an introduction of what we will discuss in closed session.



Second, in early spring 1983 we hosted a review by representatives of the scientific and technical communities. The question that we asked them was what promising technology is there to get higher altitude Asat capability?

The F-15 Asat is a system we previously came up with. However, we do need more reach in order to defend and protect satellites at higher altitudes.

Ground-based laser is a funded program taken under the SDIO umbrella. It is short wave length. Coherent short wave length energy enables it to get to higher altitude and meet our requirements there.

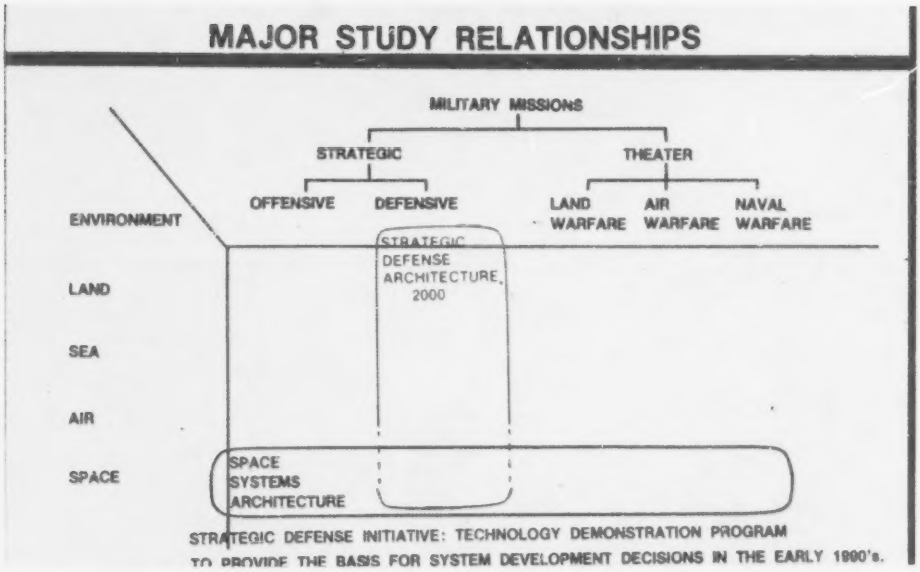


Another accomplishment—this is not the study that I am going to brief in closed session, Mr. Chairman—this is strategic defense architecture. This is an effort that we are doing under OSD sponsorship.

Dr. Wade chairs the strategic defense executive board. We have finished Phase I. That focused on air defense. The report is now finalized and ready for distribution.

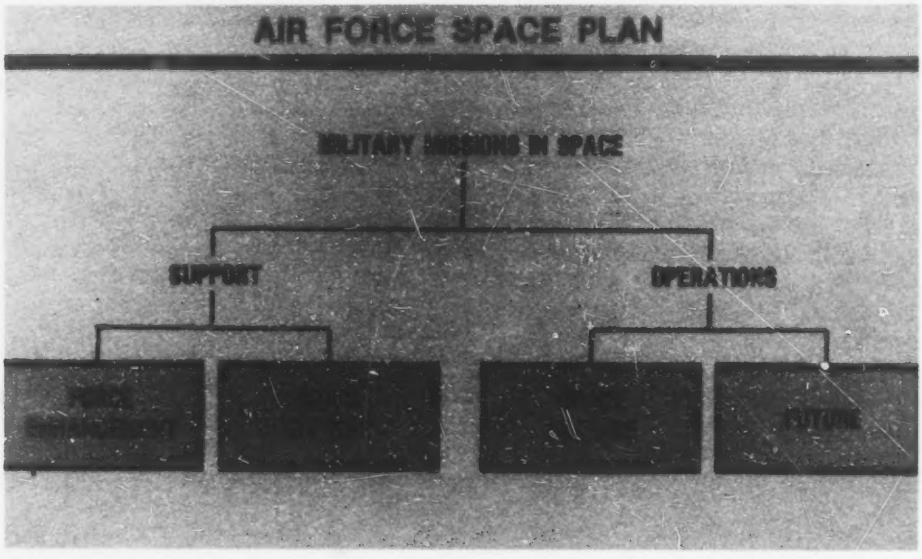
Phase I didn't do anything about cruise missile defense, but it raised the level of concern on what we do about the ALCM and SLCM threats.

Phase II is now underway. Indeed, Phase II adds space defense and ballistic missile defense. Phase I and space and missile defense will be integrated in the overall strategic defense architecture and coordinated with DOD planning for strategic offensive forces.

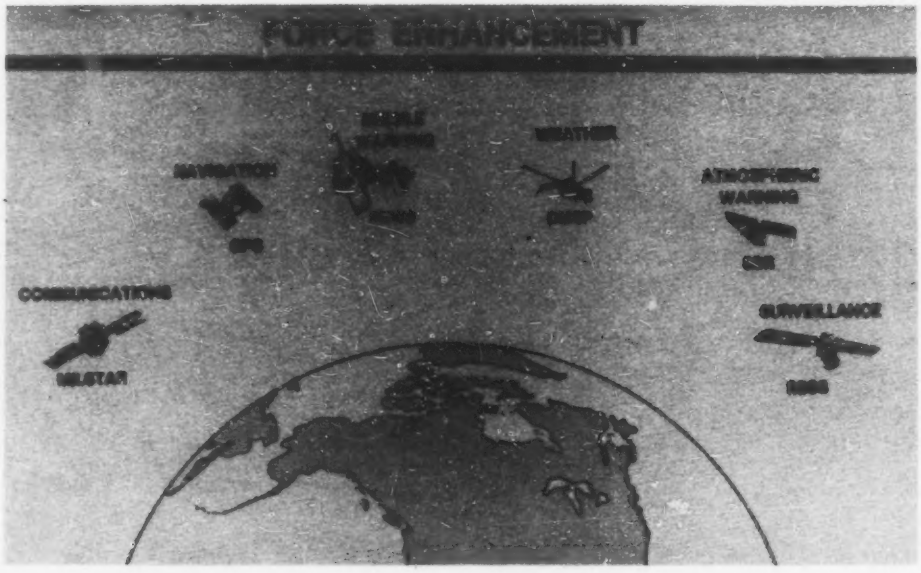


Now, to set up what follows in closed session, I need now to draw the distinction. This is SDA-2000. You can see it cuts across the planning for the four media that contribute forces to strategic defense.

While SSA—Space Systems Architecture—cuts the other direction across the strategic and theater forces. It shows what it takes to satisfy those operational requirements.



Finally, the Air Force Space Plan is now approved. It comes in two parts, support missions and operational missions.



Support covers force enhancement. This is a term used to describe the systems.

Support the worldwide military forces.

Space support is a category including launch, orbit, transfer and on orbit control of spacecraft.

Operations refers to space defense, the ability to protect, defend, assure rights of passage in space and deny the enemy the use of space when necessary.

Future missions include ballistic missile defense.

I will touch quickly on examples in each area. SEWS space-based radar and space-based surveillance systems, GPS for navigation, DMSP for weather satellites.

Milstar is the system being designed for the National Command Authorities to act worldwide, to control both tactical and strategic forces.

The navigation will be performed in a constellation of GPS satellite. You are familiar with SEWS.

Four of these satellite systems have already been assigned to the Air Force Space Command for management and operation.

Space-based radar, we have a requirement from the Navy, and the Navy and Air Forces will get together in the future and get an R&D program underway.

Space-based surveillance system refers to one that is now called, under the SDIO, Space Surveillance and Tracking System [SSTS], but our requirement, the Air Force requirement here is to end our dependence on oversea's ground stations, that worldwide network, and to bring that surveillance job to a space platform which not only can do it better but move it into space where we also have better coverage. We have poor coverage in the Southern Hemi-

sphere for space surveillance. The future system to fix this is now called SSTS.

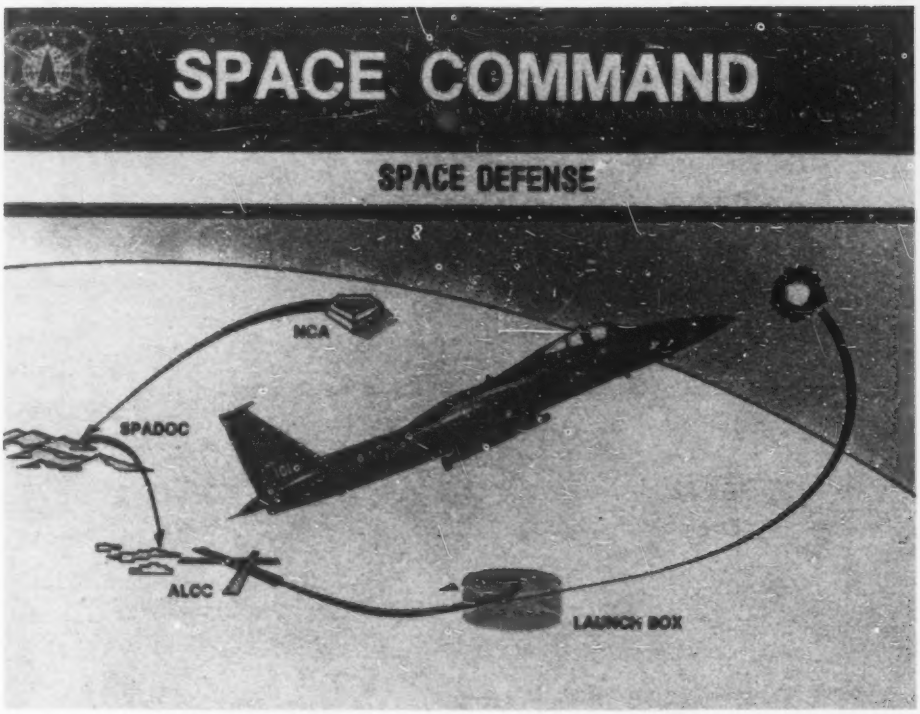
Here is an advanced program for SEWS. We had called it AWS. It is now referred to as BSTS, also now under the SDI umbrella. Between the Air Force and SDIO, we have a lot of things to discuss because they are now programmed under SDI.

SPACE SUPPORT - - CSOC

As an example of space support, we like to point to the Consolidated Space Operations Center. This is what it looks like currently. It is a $1.2 billion program in Colorado Springs.

Most military satellites in the future, operational satellites, will be controlled from this facility as will the DOD shuttle flight.

This is the operations building. It gives you a feel for the size. It has 300,000 square feet under roof today.



For space defense we turn to the F-15 Asat program. If there were a satellite threatening our spacecraft and a decision were made to take it out or if there was a Soviet satellite providing support to Soviet ground forces and we decided we should negate that, that decision would be passed to the Operations Center at Cheyenne Mountain. The mission profile is calculated and passed to the Air Launch Central Center at Langley Air Force Base, and a tape would be loaded in the F-15. The Asat missile would be uploaded on the aircraft and launched to intercept the target.

SPACE COMMAND
BALLISTIC MISSILE DEFENSE -- POTENTIAL MISSION
• "...DECREASE OUR RELIANCE ON THE THREAT OF RETALIATION..."
• "...INCREASE THE CONTRIBUTION OF DEFENSE SYSTEMS TO OUR SECURITY AND THAT OF OUR ALLIES..."
• "...DEFINE A LONG TERM R&D PROGRAM..."
• "...ULTIMATE GOAL OF ELIMINATING THE THREAT POSED BY NUCLEAR BALLISTIC MISSILES..."
PRESIDENTIAL POLICY STATEMENT
25 MAR 83

For potential future missions, of course, we do turn to ballistic missile defense. These are quotes from the President's speech on March 23, 1983. I say that the question asked is very little different from the question the national leadership asked in the sixties. It has been re-asked.

I believe the answer will be different, technology is now mature enough for us to do something about the lack of ballistic missile defense.

In closing, sir, the motto of the new Air Force Space Command is "Guardians of the High Frontier." We are working hard in Colorado Springs to make it so.

Senator WARNER. Thank you very much.

General Kutyna.

STATEMENT OF BRIG. GEN. DONALD J. KUTYNA, U.S. AIR FORCE, DIRECTOR OF SPACE SYSTEMS AND COMMAND, CONTROL AND COMMUNICATIONS, HEADQUARTERS, U.S. AIR FORCE

General KUTYNA. I am Don Kutyna. I have worked with General Beer since well before the formation of the Air Force Space Command.

THE AIR FORCE IN SPACE

I want to report this morning that the relationship between the developer and user has been superb as we transition our systems from an R&D to the operational forces.

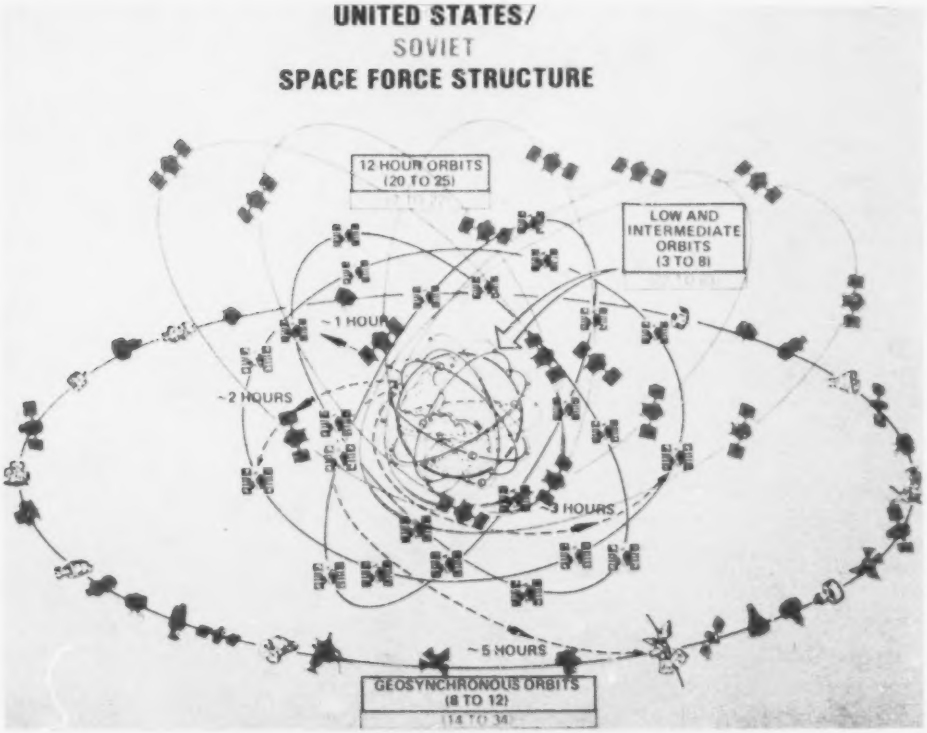
It is a pleasure to be here this morning.

I would like to talk to you about our fiscal year 1986 Air Force space budget request. Rather than speak of these space systems in a vacuum, and that is not a pun, I would like to talk about them in accordance with your request of how they fit in with our operations forces and other elements of the force structure.

Before we start, let me give you a comparison. You may have seen this before: The Soviet and U.S. force structure in space.

This is the number of launches per year accomplished by the Soviets. As you can see, the Soviets have from three to four times as many launches as the U.S. That emphasizes their dependence on space, the amount of funds and national resources they are putting into space, and their growth in the space budget is about 15 percent which is larger than any other element of the Soviet military budget. That is the bad news.

The good news is that the U.S., at a much lower rate of launches, about a quarter to a third of the Soviet's, can put up better systems and do a much better job in the space program than they can.



This is a picture of all those assets that are put into space, those many systems that General Beer was talking about.

The black indicates the U.S. forces in space. The red shows all the Soviet assets in space. You can see there is a great number.

Senator WARNER. Let me take one more look at that. It is a busy chart.

Senator GLENN. That is basically your 300?

General KUTYNA. I think the 300 would include civilian also, sir.

Senator GLENN. These are just military?

General KUTYNA. These are just military. The average U.S. is about 40 or 50.

General BEER. You know it comes very close now, Senator, on the military side because it is estimated the Soviet program has about 85 percent military components. There are very few Soviet-launched systems that are assessed in the category of strictly scientific or civil. I guess as a rule of thumb it looks like almost 50–50 if you bring in allied-related payloads.

If you look at U.S. and allied payloads vis-a-vis the Soviet Union, you are coming to nearly about a 50–50 ratio, slightly in our favor because there would be about 45 or so allied payloads there.

General BEER. Sir, we can provide you the exact numbers in the next session.

General BRANDT. Those are available.

[The information follows:]

ASSETS IN SPACE

The following is a compilation of space assets:

Country/organization	Earth orbiting satellites	Deep space satellites	Earth orbiting debris	Deep space debris	Total
United States	469	30	2,283	44	2,826
Soviet Union	824	33	1,573	9	2,439
England	9	0	1	0	10
Italy	1	0	0	0	1
Canada	13	0	0	0	13
France	12	0	21	0	33
Australia	1	0	0	0	1
Japan	26	1	35	1	63
West Germany	3	2	0	1	6
NATO	6	0	0	0	6
People's Republic of China	3	0	2	0	5
India	7	0	4	0	11
Spain	1	0	0	0	1
European Space Agency	15	0	14	0	29
France/West Germany	2	0	0	0	2
Indonesia	3	0	0	0	3
Intelsat	32	0	0	0	32
Brazil	1	0	0	0	1
Saudia Arabia	1	0	0	0	1
Total	1,429	66	3,933	55	5,483

Of the 469 U.S. earth orbiting satellites [deleted].
Of the 824 Soviet earth orbiting satellites [deleted].

General KUTYNA. I would like to break down the presentation in these basic mission areas. Space launch and operations, strategic command, control and communications (C^3), and strategic defense and how we enchance our forces.

OVERVIEW

Space launch and operations.
Strategic command, control, communications.
Strategic defense.
Force enchancement.

To get into space, our primary expendable launch vehicles consist of the Titan and the Atlas. We are transitioning from the expendables to the space shuttle which will be our primary access to space.

The great majority of Air Force missions will fly on the space shuttle and we will pick up one-third of the manifests of all available space shuttle flights.

To provide for the health and welfare of the assets, once they are on orbit, we have a Satellite Control Network centered at Sunnyvale, CA, with remote tracking stations around the world to track and control our satellites.

That is our present structure.

In the future we are going to upgrade our Satellite Control Network and supplement it with a Consolidated Space Operations Center which General Beer talked about. It has two functions.

First, to provide a dual node, increased capacity for satellite tracking.

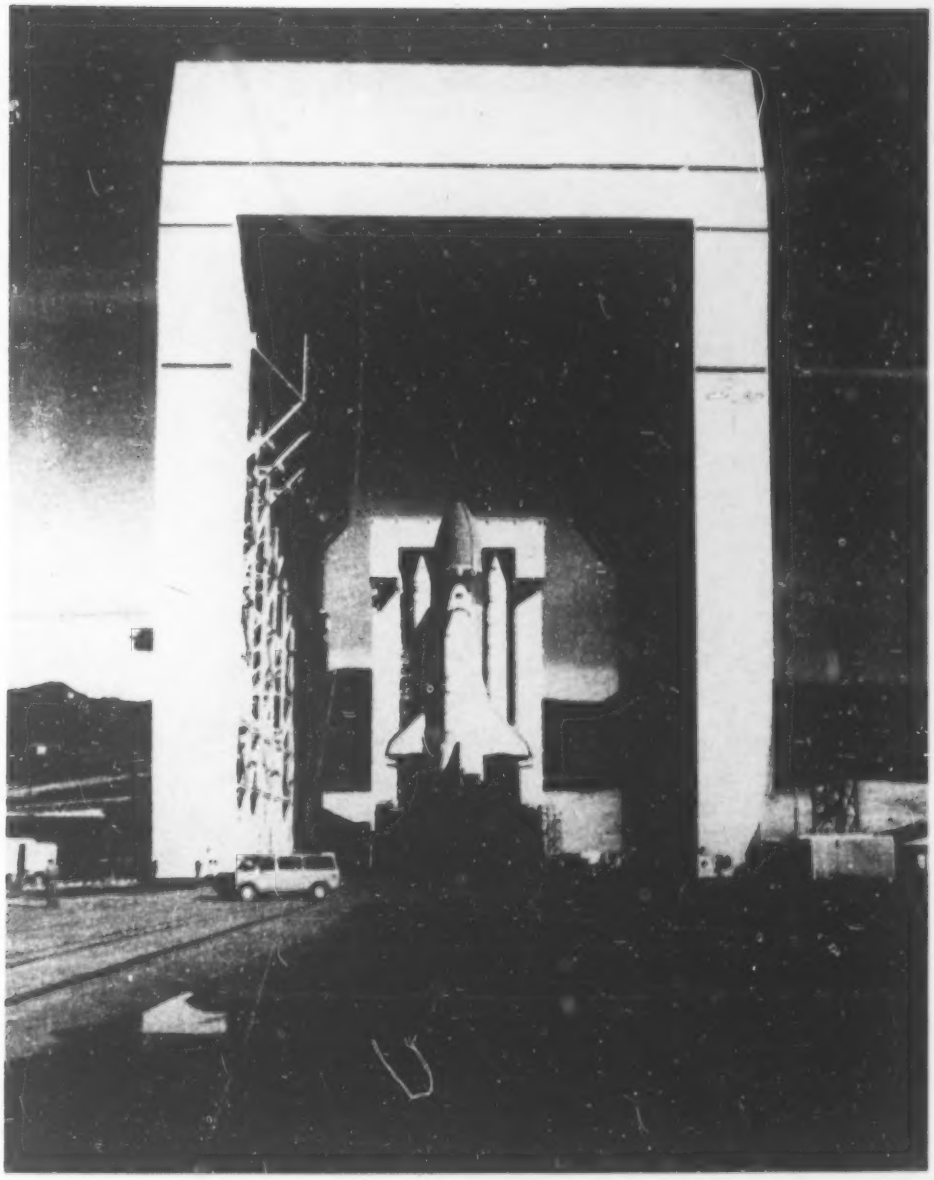
And, second, to provide dual node, higher capacity and a higher level of security than Johnson Space Center.

Once we get into orbit with the shuttle or an expendable launch vehicle, we usually get no higher than 100 or 300 miles. We need to get to geosynchronous orbit; therefore, we need an upper stage.

The upper stages in the inventory are the Inertial Upper Stage, Payload Assist Module and the Transtage. We are now developing a new upper stage called Centaur G and G Prime for military and civilian use, respectively.

We see about 19 of these in our mission model. I believe NASA has three they are looking at.

As a complement to the space shuttle to provide sure access to space, you are aware we are pursuing a program of purchasing 10 expendable launch vehicles. We have just completed the competition for that system and the Martin Marietta Titan 34D–7 has been chosen to provide complementary access to space.



Vandenberg is to provide the west coast launch facility for the shuttle so that we can go into a polar orbit. That has come a long way since last year. That site costs $2.8 billion to build.

Here you see it a few weeks ago with the space shuttle *Enterprise* erected so that we can go through the preliminary qualification test for a first launch from that facility.

The facility itself will be ready in October of this year. The first launch will probably not occur until February or March of 1986.

Let me talk now about strategic C^3. Here you see the many assets that make up strategic C^3 that allows our National Command Authorities to command and control our strategic forces.

First, BMEWS in Alaska, and Thule, Greenland, and Fylingdales Moor, England, provide our ballistic missile early warning. Those are tied together through our spaceborne C^3 system.

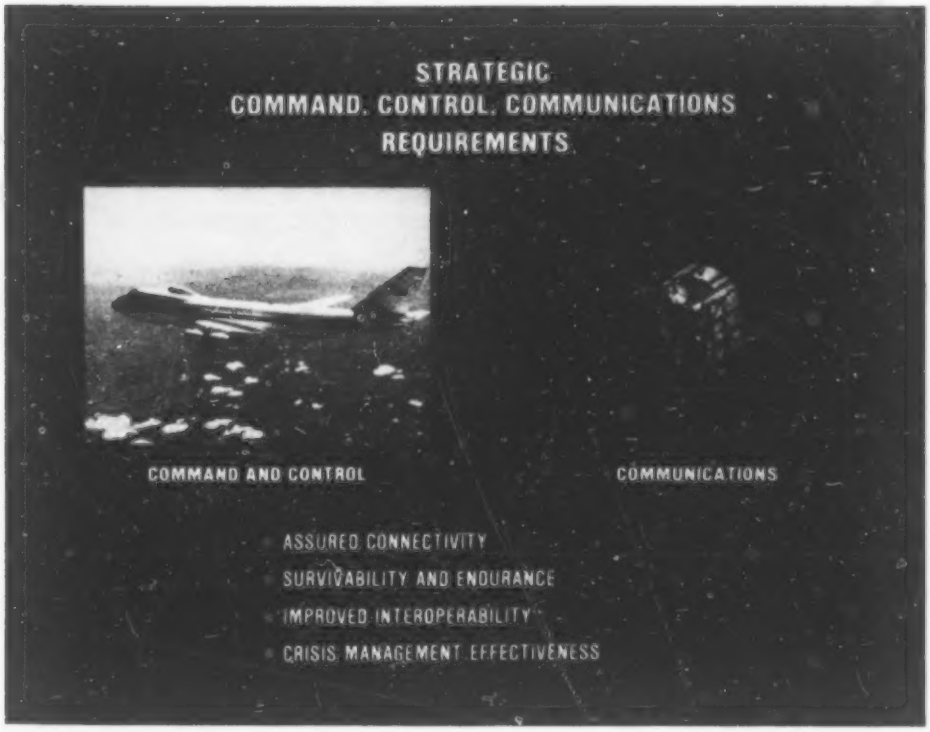
For submarine-launched ballistic missiles we have PAVE PAWS on the west coast and at Otis Air Force Base on Cape Cod.

The Navy FLTSATCOM carries as a payload the Air Force SATCOM which provides communications to our forces. We use some commercial satellites that provide the warning and command communications, and our baseline system has been the Defense Satellite Communications System DSCS II. We have several of those. They provide the primary spaceborne assets to get the C^3 to our forces. They are complemented by airborne assets, EC-135's and E-4B's, all four of which have been delivered, and Navy Tacamo aircraft.

We also have a ground segment of SHF communications which then can connect the command centers with headquarters SAC and National Command Center to our missiles, bombers, and naval forces.

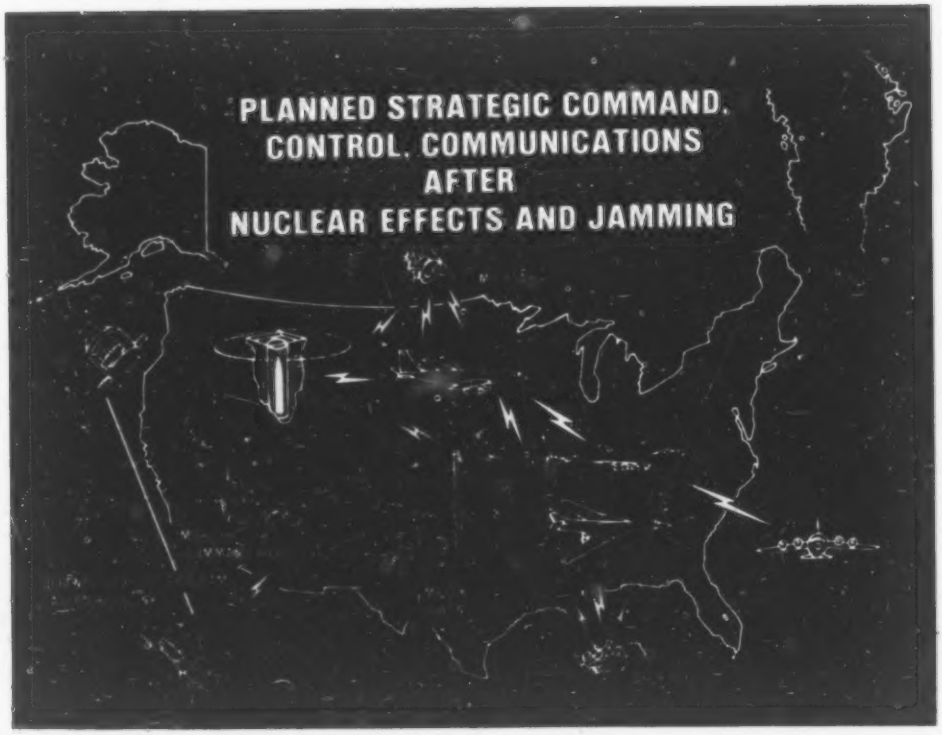
These systems work well today, but they are not designed to meet the future threat. That threat consists primarily of nuclear effects, such as electro-magnetic pulse, blackout, and scintillation and physical destruction that could cut these lines of communications.

We could lose all our sensor systems which are ground based. We could lose ground-based command centers and our reliance will be entirely on the airborne assets for the National Command Authority to execute our strategic forces.



That is an unacceptable situation and our requirements call for assured connectivity during wartime and survivability and endurance.

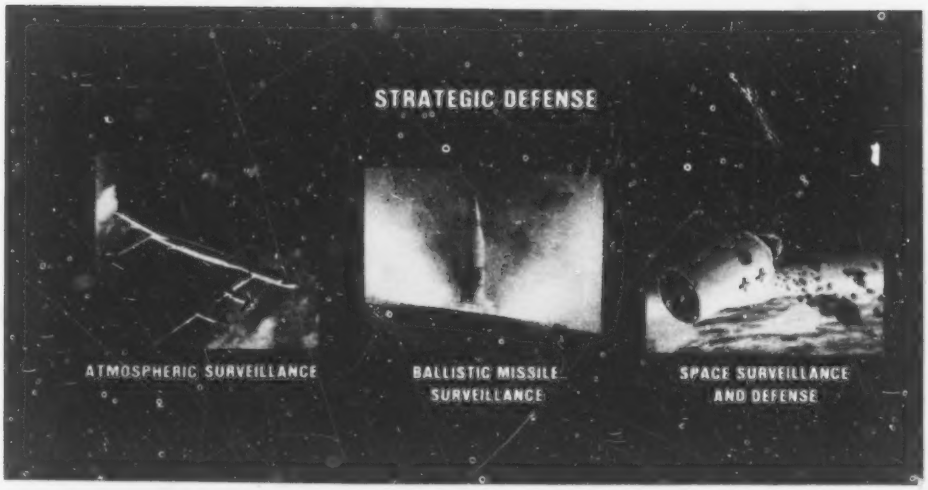
Improved interoperability will allow us to command our forces in the most effective way during all crises.



To accomplish these goals, we have introduced a few new systems. The DSCS II is being replaced by a DSCS III satellite, one of which was launched in 1982 and is operational. That satellite has greater survivability and resistance to jamming than the DSCS II system and will be our future wide band satellite to communicate between forces.

The keystone to our system is a Milstar satellite. It is designed to survive in a nuclear environment to pass narrow band data, be resistant to jamming and nuclear effects, and to withstand an Asat attack.

Those systems are complemented by mobile command posts on the ground, and by a ground-based system for the Minimum Essential Emergency Communication Network called GWEN. GWEN will use a great number of ground stations which will be resistant to nuclear effects and through which we can pass the information to our forces as required.



Let me now switch to strategic defense. By strategic defense I mean three areas:

Atmospheric surveillance against the Soviet bomber and cruise missile threat.

Ballistic missile surveillance.

And space surveillance and defense, should it be required.

Here is our plan for a North American air space surveillance system. You can see the amount of space outlined here. These are the systems that would give us a barrier to warn us of a Soviet attack and give us the tracking capability to negate that attack.

The cornerstone of that system is what we call an Over-the-Horizon Backscatter [OTH–B] radar of which we have an experimental system working in Maine in the past few years.

You will see the east coast barrier here, west coast barrier here, and southern barrier installed here.

We will also put one in to cover the Aleutians to protect our valuable assets in that chain.

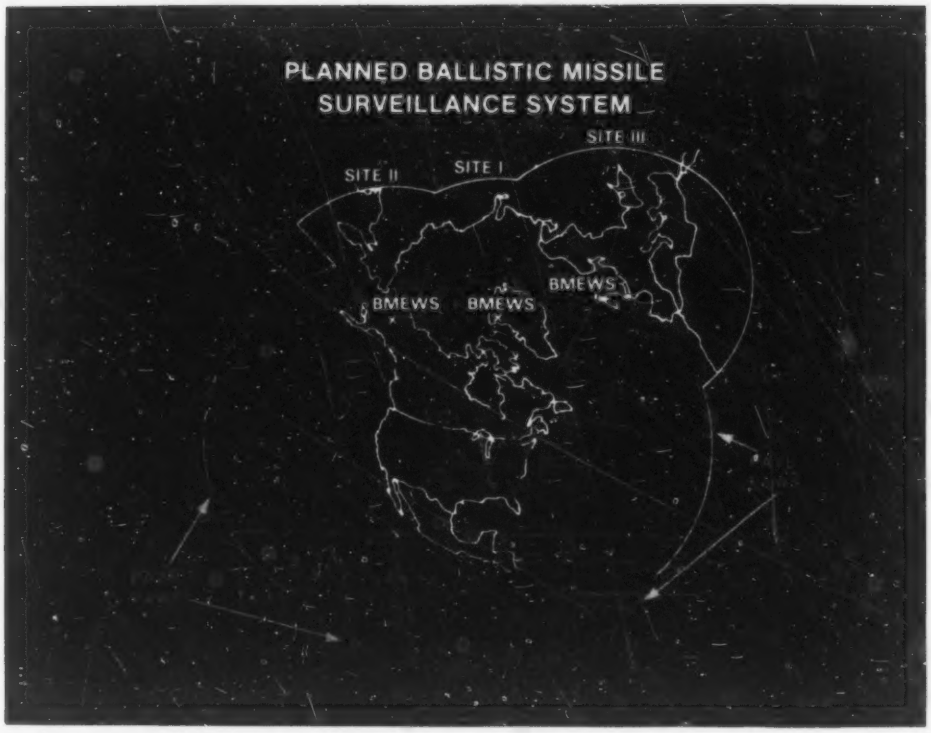
These systems operate all day, all night down to the surface, operate from a range of 500 to 1,800 miles from transmitting sites and provide not only strategic warning, but tactical warning that the enemy is coming, for both cruise missiles and aircraft and allow us to track our forces to intercept those particular enemy assets.

That system, however, does not work when looking northward because of the aurora. It is blacked out by the aurora. We need what I call the North Warning System which will replace the old DEW-line system.

It will consist of 52 minicenters of unattended radars which go down near the surface and also detect cruise missiles and bombers. It is tied into the existing Alaska system called SEEK IGLOO and

OTH-B to give us a surveillance around the circumference of the United States.

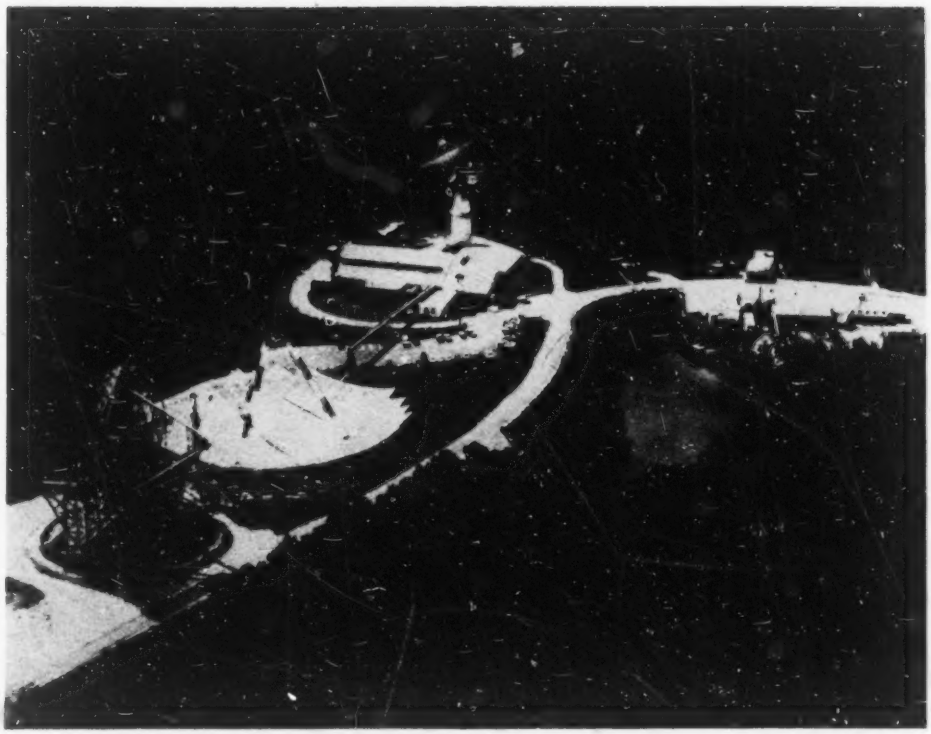
Those systems in the future may be complemented by space-based assets. We now have experiments which are looking at infrared tracking, in the TEAL Ruby Experiment. We are doing preliminary studies on space-based radar designs with the U.S. Navy.



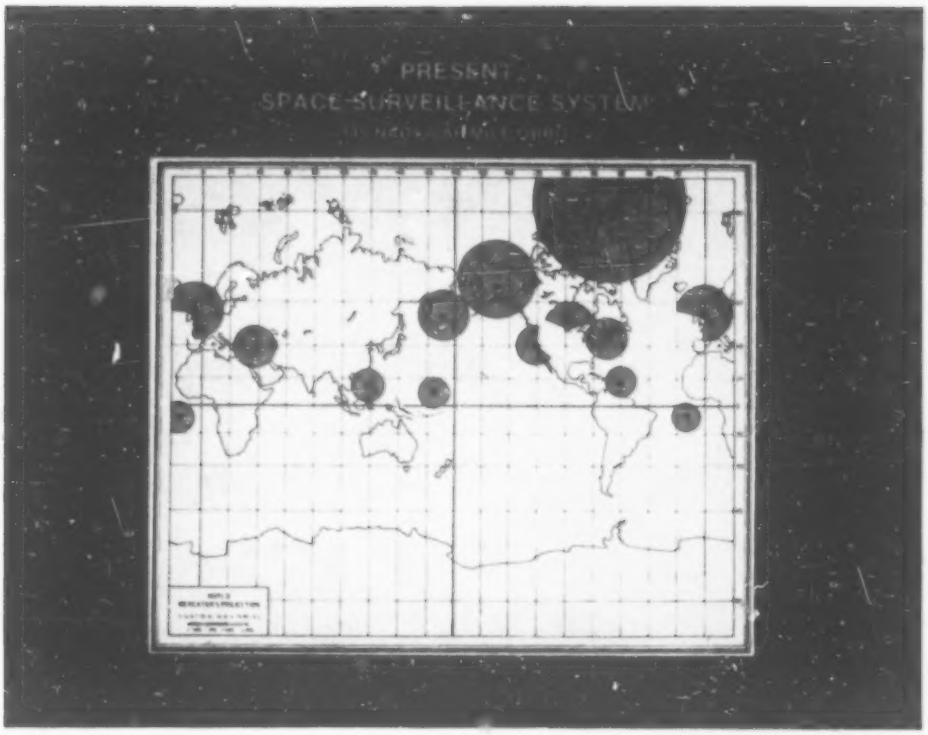
For ballistic missile and sea-launched ballistic missile warning, we have a Ballistic Missile Early Warning System [BMEWS]. It is a 20-year-old system which we are upgrading currently. We are providing coverage as shown here by the yellow line.

Then we have the PAVE PAWS sea-launched ballistic missile detection system, two sites of which are show here, Cape Cod and in California.

We presently have under construction two more PAVE PAWS sites, one in Texas and one in Georgia, that will give us the coverage around the periphery of the United States to give tactical warning of ballistic missile and SLBM attack.

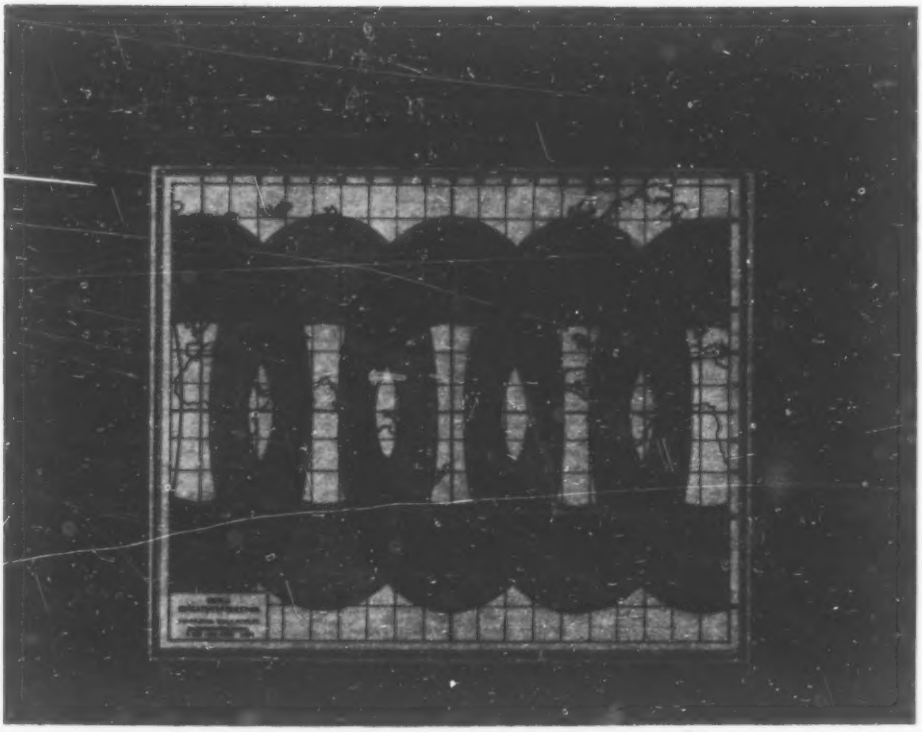


For space tracking, the tracking of objects in space, we currently rely on a system of ground-based radars such as this one shown in Massachusetts. These have served us well over the years.

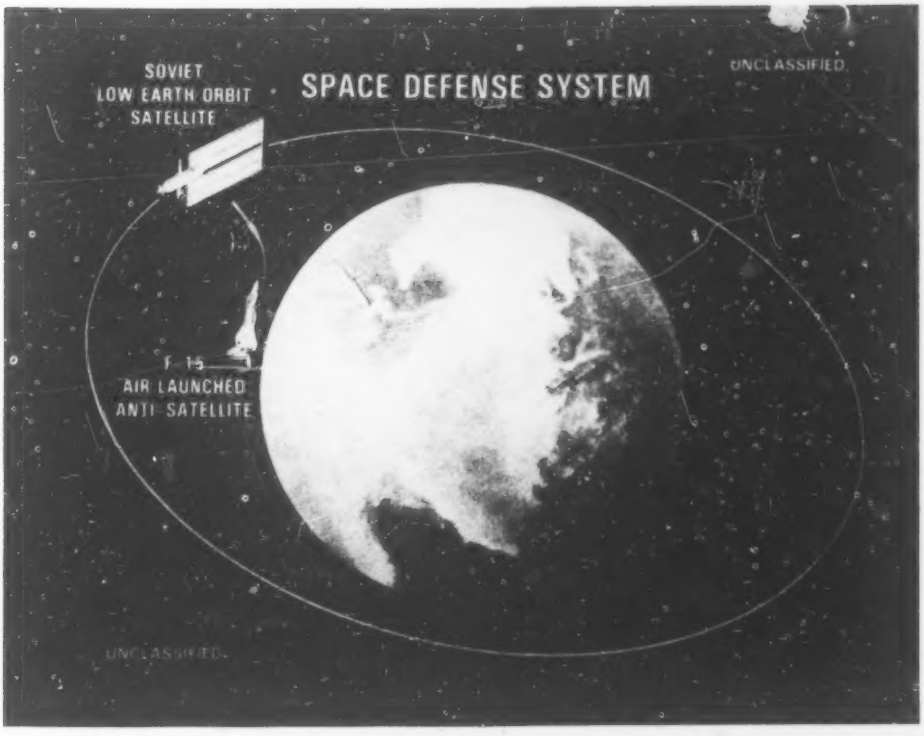


However, because they are ground based, they are limited by the horizon and can only see those space objects that fly directly over them as shown there by these circles. If the satellite is not over the station, you cannot see it and that is not satisfactory for some of the missions we see in the future.

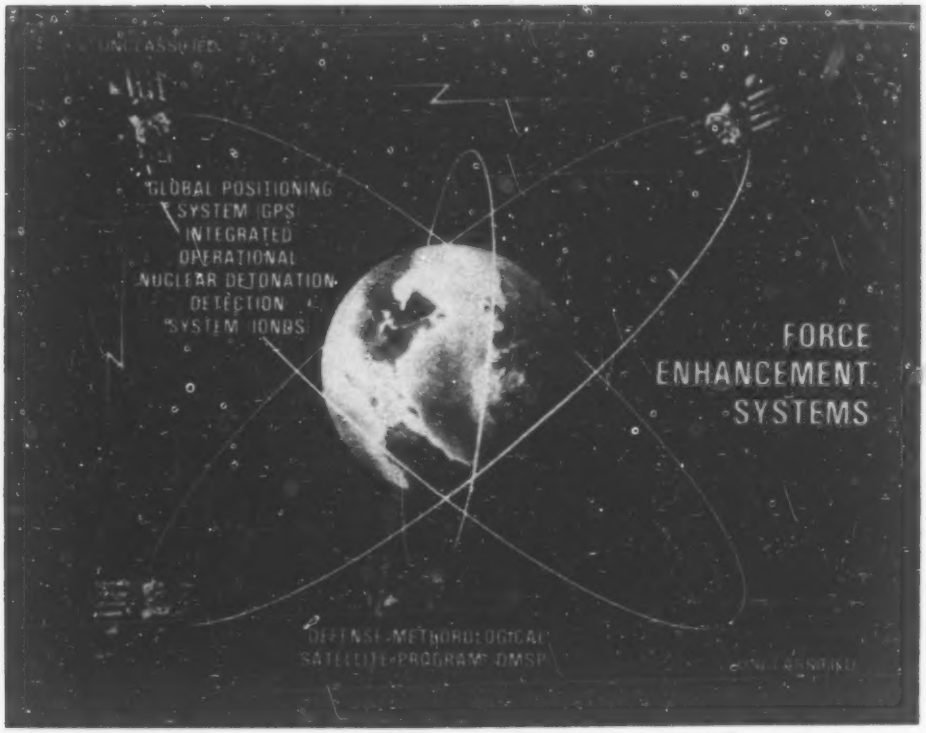
Therefore, we are looking at a space-based surveillance system. This has been taken over by the Strategic Defense Initiative Program Office.



It will provide us a superior system because it is not limited by the horizon and can see space objects whenever they fly over the southern area. It has a much broader coverage.

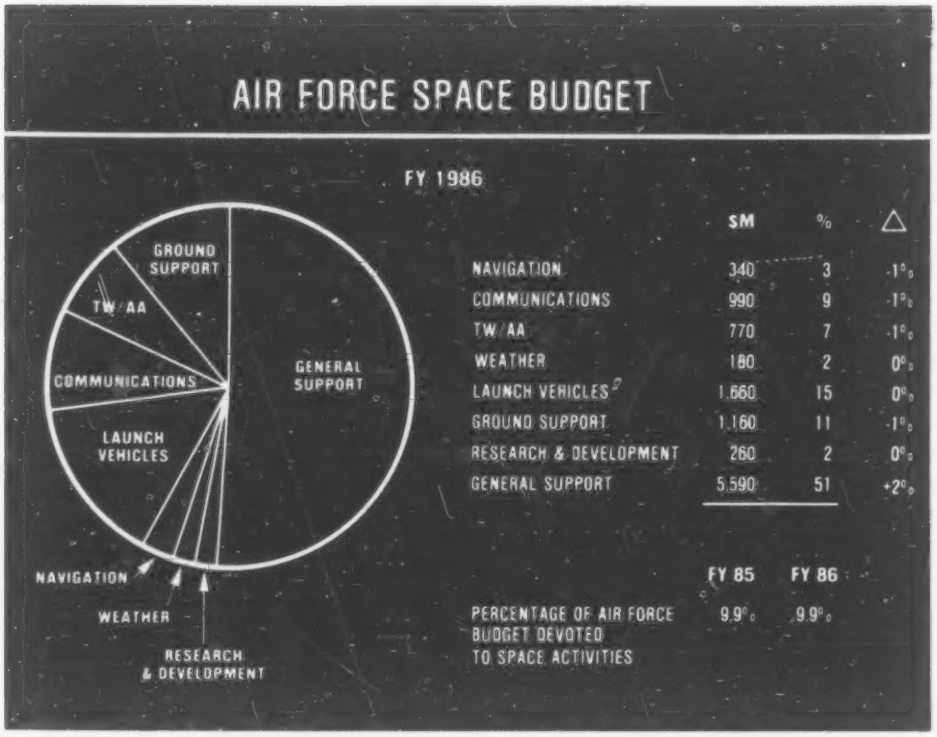


Finally, we have for space defense, the Asat system. This system is carried on the F-15 to intercept low Earth orbiting satellites. We are progressing on this system. We have had two flights, one in January and one in November. We have two more scheduled for this summer.



For navigation we have a Global Positioning System [GPS] and it will be 18 satellites that will provide very accurate position, velocity and time data, to our forces around the world, night, day, in all weather.

Finally, the nuclear detonation detection system which is hosted on GPS satellites to provide information on nuclear detonations should those occur.



This is a breakout of our budget for fiscal year 1986. You can see the areas broken down: gound support, tracking systems and other support for our space satellites.

Other areas are tactical warning and attack assessment systems, communication systems, launch vehicles, navigation, weather, research and development.

Our special activities programs fall in the area of general support. You can see there is no change percentagewise from fiscal year 1985 to 1986 and very little change in the elements in this 1986 budget.

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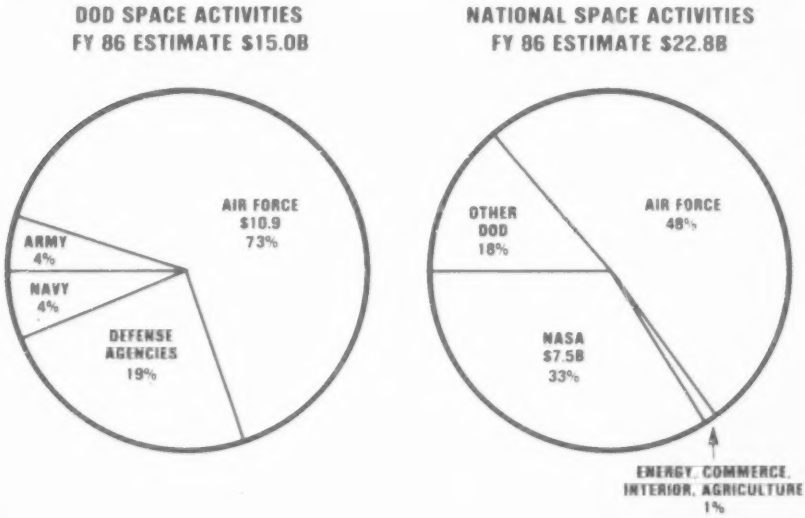
DOD AND NATIONAL SPACE BUDGETS



Here is how that budget fits in the overall DOD space activity with the Air Force having almost three-quarters of the funding.

That concludes my portion of the testimony, sir. I will be glad to answer any questions.

[The joint statement of General Beer and General Kutyna follows:]

JOINT PREPARED STATEMENT OF MAJ. GEN. CARL N. BEER, DEPUTY CHIEF OF STAFF, PLANS, U.S. AIR FORCE SPACE COMMAND; AND BRIG. GEN. DONALD J. KUTYNA, DIRECTOR OF SPACE SYSTEMS AND COMMAND, CONTROL, COMMUNICATIONS

Mr. Chairman, I am the Deputy Chief of Staff, Plans, U.S. Air Force Space Command. We are delighted to have the opportunity to talk to your committee on Air Force Space Command and Air Force Space programs. We welcome the interest of your committee in this vital and growing area of Air Force activities. In response to your request for information on the Naval and Air Force Space Commands, Air Force Space programs, and the Unified Space Command, we have accompanying us today Major General Thomas C. Brandt, Joint Chiefs of Staff, Director, Joint Planning Staff for Space and Commodore Richard H. Truly, Commander Naval Space Command. With your permission Mr. Chairman, we propose to enter our formal statement into the record. I will use briefing slides to present first an overview of Air Force Space Command, its accomplishments and future plans, and then General Kutyna will provide an overview of the Air Force space program and budget request.

With your permission Mr. Chairman, I would like to explain the relationship between the three commands within Colorado Springs before I start my discussion on Air Force Space Command.

NORAD and ADCOM have responsibility for missile warning and the Air Defense of North America and the United States respectively. In space, ADCOM is responsible for the defense of U.S. space assets, while Norad is responsible only for space surveillance. The U.S. Air Force Space Command supports both Norad and Adcom—

as well as other operational Unified and Specified commands and the military services—by acting as the resource manager to organize, train, equip and administer, as well as to manage and control U.S. missile warning, and assigned space surveillance and certain orbiting space assets. The people, resources, and missions overlap all three commands.

I will cover the following items in response to your request: When and why Space Command was formed, Space Command's accomplishments, Space Command's plans for the future.

Air Force Space Command was officially established as the Air Force's newest Major Command on 1 September 1982, with its headquarters located in Colorado Springs, Colorado. The establishment of this command marked a crucial milestone in the evolution of military space operations. Several factors converged in 1982 which led to the establishment of the Air Force Space Command.

Air Force Space Command was the logical response to the growing national security demands on the expanding military space program. The military use of space has become an increasingly important element in the DOD capability to preserve the freedom and security of the United States with its values and institution intact. In 1960, ground systems and aircraft were our primary means of obtaining worldwide information and transmitting it around the world. This is no longer true. Now, in many cases, there are no cost effective alternatives to space systems. For example, the survivability of the alert bomber force is extremely dependent on missile warning data provided by satellite. All of the military services receive key weather data from the Defense Meteorological Satellite Program [DMSP]. 70 percent of our long haul communications are transmitted via satellite. From within the military came the recognition and better understanding of the contribution of space systems in countering, to some degree, the great quantitative advantage that Soviets have over the United States. Indeed, the dependence of our worldwide military forces on the products of satellite systems is now widely recognized. President Reagan reaffirmed on 4 July 1982 that the most important goal of the U.S. space program was to strengthen national security. As a result we had policy which underscored the need to more Air Force operational space programs out of the Research and Development community to an operational force commander.

From the Soviets came the pressure of a growing threat, and an aggressive military space program. The Soviets are well aware of the military utility of operating in space and have committed significant resources toward a sizable space presence. They are continuing to exploit space for surveillance, communications, navigation and targeting in support of their land, sea and air forces. Plus, their high satellite launch rate attests to the importance they attach to military space activities. Over the past decade, they have launched four to five times more satellites than the United States. Over 70 percent of their launches are strictly military. They have the world's only operational space weapon system, an orbital anti-satellite system which they have demonstrated on many occasions. The Soviets are supporting an active military manned space program. They have a solid ground based electronic warfare system and their high energy laser efforts are three to five times that of the United States. The Soviets are doing all they can in space . . . their efforts are apparently constrained only by technology. With the Soviets in space to this extent, we must preserve our right of self defense as part of deterrence. With the establishment of Air Force Space Command we have centralized our space planning and placed our space systems into the established military command structure. This centralizes the organizational response to the Soviet threat to our space systems so that a clear and cogent voice can be heard both as an advocate for needed responses and as an advisor to the National Command Authorities.

Mr. Chairman, now that I have discussed why the Space Command was formed, I would like to discuss what we've accomplished in the past two years. In January 1983, we activated the first space wing at Peterson AFB, Colorado. The first space wing provides day-to-day management for the three Air Force bases, four Air Force stations and 16 Space Surveillance and Missile Warning Sensors. Over 8,500 people, military and civilian, are assigned to Space Command.

In May 1983, Space Command was assigned responsibilities for two operational satellite systems, a satellite ballistic missile warning system and the Defense Meteorological Satellite Program [DMSP]. We subsequently were assigned responsibility for two programs, presently in Research and Development—the Global Positioning System and Milstar Satellite Communications Systems. DMSP is DOD's Global Weather Satellite System. We operate the DMSP Satellite Control Station at Offutt AFB, Omaha, Nebraska, and the two Satellite Readout Station at Loring AFB, Maine, and Fairchild AFB, Washington. The Global Positioning System, scheduled to become fully operational in the late 80s, is a space based navigation system that

will provide precise navigation data to U.S. and Allied land, sea and air forces. Space Command will also be responsible for Milstar, the worldwide jam-resistant and survivable satellite communications system that will provide connectivity for our strategic and tactical forces.

Mr. Chairman, to accommodate our expanding space mission and to incorporate needed upgrades, Space Command is building new facilities. The Test, Development and Training Center [TDTC], to be located on Peterson AFB, Colorado, is where we will develop and test off-line software for the Cheyenne Mountain Complex computers and conduct combat crew training for our sensor system operators. Ground breaking occurred in September 1984 and construction should be finished in July 1985. The Consolidated Space Operations Center [CSOC] presently being built 9 miles east of Peterson AFB, Colorado, will be the hub for military space operations. That is where we will manage and control our space systems. Ground breaking occurred in May 1983 and the Corps of Engineers will turn the facilities over to the Air Force in October 1985.

CSOC will have two functions. One function, the Satellite Operations Complex, will provide an operational capability to control military satellites. The first Mission Control Center will be operational in 1987. The other function, the Shuttle Operations and Planning Complex, will provide a secure operational capability for military Shuttle missions. In addition, the CSOC will host the GPS Master Control Station starting in 1986, the Milstar MCS, and other future programs. We are now working with the State of Colorado to obtain some additional land about the CSOC, both to provide a buffer zone and accommodate future expansion.

Mr. Chairman, space system survivability is another area that needs more emphasis. Today, some of our space systems are considered to have a limited capability. Space Command conducted the Space Systems Architecture Study, which will be covered in the closed session, in which we developed a space system survivability strategy for our critical space systems. As the operational manager for many of these systems we must continue working to ensure that the appropriate survivability features are incorporated during system development so that the mission capability needed so vitally by our operational forces will be there in times of crisis and conflict. As one illustration, we are moving away from the common user satellite control network to a more survivable architecture of dedicated, interoperable ground stations and mobile units.

Traditionally, the space operational intelligence activities has focused in two areas: current inteiligence about Soviet space vehicles and orbits; and detailed technical capabilities of future Soviet systems. What's missing is the day-to-day analysis of Soviet space activities and systems which would provide answers to questions such as what are the Soviets doing in space? Why are they doing it? And how does their space program assist terrestrial forces? So in September 1984, Space Command activated the Space Operational Intelligence Center. This represents our first step in developing a capability to meet the intelligence needs of military space operations. The SOIC will satisfy a wide range of new space-oriented intelligence requirements not currently being addressed.

We have been collecting space surveillance data with a network of radar and optical sensors located around the world. These systems are doing a good job of satellite surveillance today. But with the increasing number of U.S. and foreign satellites placed in orbit each year, the higher altitudes where they operate, and their longer operating lifetimes, improvements are needed. Programs are underway to extend the range of the tracking radars, to deploy a Ground-Based Electro-Optical Deep Space Surveillance System and deploy a Pacific barrier to provide additional early surveillance of Soviet space launches.

Mr. Chairman, Space Command is the lead Air Force major command for Air Force space planning. Our roadmap for comprehensive modernization of space systems and for an affordable acquisition strategy for developing and deploying space systems out to the year 2000 culminated, in 1984, with the completion of the Air Force Space Systems Architecture Study.

The Space Systems Architecture was an out growth of the Space Surveillance Architecture Study. The purpose of the Space Surveillance Architecture Study was to conduct an analysis and to project an architecture for the orderly evolution of surveillance capabilities to satisfy future DOD needs for operational and technical information on objects and events in space. The surveillance system, depends heavily on ground sites that are on islands, near coastlines, or in foreign countries.

Mr. Chairman, the motto of the new Space Command is "Guardians of the high frontier"—we're working hard to make it so.

This concludes my formal statement Mr. Chairman. With your permission, General Kutyna will now discuss the Air Force space programs.

General KUTYNA. Mr. Chairman, I am pleased to appear before you today in support of this hearing on military space programs. My duties include responsibilities for development and acquisition of Air Force space and command, control, communications systems.

Today I will cover the Air Force Space Programs submitted in the FY 86 budget request.

As mentioned earlier, space systems have become an integral part of our military forces. I will discuss our space systems in the larger context of integrated military systems. Fundamental to the continued success of military space systems, is having a flexible, robust and affordable means of delivering satellites to orbit. The Space Transportation System [STS] is the primary means for providing DOD government, commercial and many foreign users, routine access to space. The STS consists of the Space Shuttle vehicle, launch and landing facilities, mission control facilities, and upper stages. The National Aeronautics and Space Administration [NASA] is responsible for developing and operating the Shuttle.

The Air Force is the Department of Defense executive agent for military applications of the Shuttle. We are responsible for: acquiring and operating the Shuttle launch site at Vandenberg Air Force Base, acquiring and operating the Consolidated Space Operations Center, developing and producing the Inertial Upper Stage [IUS], and jointly developing with NASA a common Centaur upper stage. I am happy to report we have corrected the IUS flight anomaly that occurred during the NASA sponsored Tracking and Data Relay Satellite [TDRS] launch in April 1983. We identified the problems, made design corrections and thoroughly tested the IUS to ensure it was flight-ready. IUS launch operations were resumed in January 1985, resulting in a successful IUS mission.

The Space Launch Support program funds Department of Defense Shuttle operations including those at Vandenberg Air Force Base, the orbiter flight charge reimbursements to NASA, and procurement of the Centaur G, IUS, and Payload Assist Modules Delta Class II [PAM-D II] upper stage vehicles. For geostationary orbits, the Centaur G will support 10,000 pound class payloads, the IUS 5,000 pound payloads and the PAM-D II 3,000 pound payloads.

In fiscal year 1986, procurement funds are required to continue the PAM-D II multiyear procurement in support of the Navstar GPS program. Funds will also be used for IUS vehicles modified to correct the previously mentioned flight anomaly, to fully fund three fiscal year 1985 advance procurement IUS vehicles, and to provide logistics support for the IUS and the Vandenberg launch site.

The 1986 request will continue funding for a Centaur G vehicle initiated in fiscal year 1985. We will also seek to acquire another Centaur G vehicle to be funded incrementally in fiscal years 1986, 1987 and 1988 with the Research, Development, Test and Evaluation appropriation. These two vehicles will be used to launch Milstar research and development satellites. The fiscal year 1986 request will also fund the Manned Spacecraft Engineer [MSE] program and support secondary payloads that will fly on the space shuttle.

Under the Space Boosters Expendable Launch Vehicle [ELV] program, we currently acquire and launch Titan III(34)D and refurbish and launch Atlas E ELVs. In 1984, we ordered the last Titan III(34)D ELV and while the majority of our satellites transition to the Shuttle. Our last Titan III(34)D is scheduled for launch in fiscal year 1988, and our last Atlas E will be launched in fiscal year 1990. Additionally, we are implementing the President's guidance set forth in the National Space Policy and the National Security Launch Strategy to provide a limited number of ELVs to complement the Space Transportation System [STS]. This capability is critically needed to satisfy two specific requirements—the need for a launch system complementary to the STS as a hedge against unforeseen technical and operational problems and the need for a launch system suited to operations in crisis situations. On 28 February 1985, we initiated the design of a Compplementary Expendable Launch Vehicle [CELV] system as the result of completion of a year long competition for this capability. The vehicle selected, an upgraded version of the Titan called the Titan 34D-7, will be capable of launching shuttle-sized satellites. It was chosen over a field which included a commercially sponsored upgrade of an Atlas launch vehicle and a Space Shuttle derivative vehicle, the SRB-X. This program is in full consonance with the President's 25 February 1985 National Security Launch Strategy directive, and the NASA and DOD agreement on space launch reflected in the President's directive. We plan to initiate production of 10 ELVs in 1986. The initial launch capability is required in late 1988. Further, in fiscal year 1986, we will begin efforts to convert the deactivated Titan II Intercontinental Ballistic Missiles into a space launch vehicle configuration. We plan to use these existing Titan II assets to

launch a limited number of smaller satellites including the Defense Meteorological Satellite Program satellites.

Mr. Chairman, I believe this launch vehicle strategy of continuing to use the shuttle as our primary launch platform while launching certain programs on expendable launch vehicles gives us the flexibility and capability for more assured access to space.

The Air Force Satellite Control Facility provides on-orbit control for Department of Defense satellites from the Satellite Test Center [STC] at Sunnyvale Air Force Station, California, through a worldwide satellite control network which includes seven geographically-dispersed tracking stations. The current computer system in the Satellite Test Center is costly to maintain and becoming logistically unsupportable. Furthermore, it is incapable of supporting new, more sophisticated satellites now in development.

In fiscal year 1986, we will continue development and acquisition of the Satellite Control Facility [SCF] Data System Modernization program, which will correct operational limitations and form the core configuration for operations at both the Satellite Control Facility and the Satellite Operations Complex segment of the Consolidated Space Operations Center. As the Consolidated Space Operations Center is developed, the data systems modernization computers will be installed there to provide compability with the Satellite Control Facility.

Fiscal year 1986 funds will also continue development and acquisition of the Advanced Remote Tracking Station to replace or refurbish the existing remote tracking stations and complement the Data System Modernization.

Our fiscal year 1986 request is needed to continue work on the new Consolidated Space Operations Center [CSOC]. The CSOC will provide efficiencies (management, operational, and economic) by combining two major space missions for the Department of Defense—satellite control and Space Shuttle military operations. The CSOC Satellite Operations Complex will provide greater mission capability and flexibility as well as increased survivability. The Satellite Control Facility and the CSOC will provide mutual emergency backup for mission essential functions should outages occur at either center.

From the CSOC Shuttle Operations and Planning Complex, we will plan and control Department of Defense shuttle missions, provide enhanced, security protection, and alleviate projected shuttle flight planning and flight control capacity stresses. Until the complex becomes operational, control of Department of Defense Shuttle missions will be performed by the NASA Shuttle control facility at Johnson Space Center. Once CSOC becomes operational, Johnson Space Center will serve as the backup to CSOC for Department of Defense missions. The two control facilities will thus increase Shuttle system survivability, security and flight rate capacity.

STRATEGIC COMMAND, CONTROL AND COMMUNICATIONS

Mr. Chairman, our strategic Command, Control, Communications (C^3) systems are composed of fixed and mobile command centers and ground, airborne and space communications platforms. Collectively, these systems connect warning sensors, command and control centers and nuclear forces during peacetime and all phases of conflict.

The capability of the U.S. nuclear forces to deter attack depends upon the Soviet's perception of their own capability to successfully launch a preemptive first strike. Through our strategic C^3 systems, we report events that are critical to the survival of strategic forces. Strategic C^3 systems provide the link between the National Command Authority and the JCS, through the Unified and Specified Commands, to U.S. nuclear retaliatory forces.

Due to its importance to deterrence, upgrade of U.S. strategic C^3 was made the first priority of the President's strategic modernization program. These upgrades will enhance the resilience of these systems against physical attack, under jamming or spoofing conditions and nuclear effects environments.

Although no single system can achieve all the desired characteristics to meet the current and projected threat, a proper mix of ground based and satellite systems, along with redundancy of critical C^3 nodes, will provide high confidence that our strategic C^3 systems would survive and endure through the trans- and post-attack time periods. All elements of our strategic deterrent force must be perceived to be strong if our deterrent is to remain credible.

The Milstar satellite communications system will be a survivable, jam-resistant and secure, worldwide communications system for the strategic and tactical forces of all services, and the National Command Authority. By employing advanced countermeasure techniques, Milstar will be highly survivable and provide the minimum

essential communications needed at all levels of conflict. Milstar is a crucial part of the President's strategic modernization program and has been designated as a program of highest national priority.

The Air Force is developing the satellites, system control equipment and airborne terminals, while the Army and the Navy are developing ground and seaborne terminals, respectively. Deployment of the Milstar system will begin in the late 1980s and continue into the 1990's.

The Air Force Satellite Communications [AFSATCOM] system provides command and control of strategic forces and is used in peacetime for training, contingency operations, crisis management, search and rescue, humanitarian missions and relay of reconnaissance information. Its primary wartime function is to provide worldwide, two-way command and control communications for the National Command Authorities, the Joint Chiefs of Staff, the Commanders-in-Chief of U.S. strategic nuclear forces and other high priority users.

AFSATCOM consists of ultra high frequency communications packages in orbit aboard Fleet Satellite Communications satellites, Satellite Data System satellites and other host spacecraft. The ground segment consists of terminals for airborne and ground command centers, strategic bomber and reconnaissance aircraft, airborne communications relay platforms and selected Army missile sites.

Last year we achieved full AFSATCOM operational capability with more than 500 ground and airborne terminals installed and operating. We are now upgrading AFSATCOM terminals to permit transition to the Milstar satellite communications system. These modifications will also improve terminal performance during jamming and in periods of ionospheric disturbances. By starting this effort now, virtually all the AFSATCOM terminals will be capable of using the Milstar spacecraft ultra-high-frequency channels after the first Milstar launch.

The Minimum Essential Emergency Communications Network [MEECN] insures delivery of critical messages under stressed conditions. New very-low-frequency/low-frequency receivers are in development to provide long range, survivable, data communications to the strategic bomber aircraft. Also, the Ground Wave Emergency Network, currently in full scale development, will provide the MEECN with its first C^3 system designed to meet the high altitude electromagnetic pulse threat.

The Ground Wave Emergency Network [GWEN] will provide assured communications among the National Command Authority, major command centers, missile warning sites, and U.S. based nuclear forces. Survivable communications are provided through a network of radio relay stations that interconnect user terminals at these installations.

Full scale development of the prototype network, including relay stations, input and output ground and airborne terminals, and receive-only terminals, began in February 1983 and will continue through early 1986. During fiscal year 1986, prototype network testing will be concluded. We will conduct initial operational test and evaluation–, with those results, make a production decision in 1986. Full operational capability is planned for fiscal year 1989.

Our MEECN very low frequency/low frequency [VLF/LF] improvements project provides for improved dissemination of war orders through secure VLF/LF Systems. In fiscal year 1986, we are continuing the development of the Diversity Reception Equipment for deployment aboard on Worldwide Airbone Command Post aircraft and at selected sites. This new equipment will upgrade and replace existing equipment in both ground and airborne transmit and receive applications. Communication range, message accuracy and transmission time will be greatly improved. Also, development will continue for the VLF/LF miniature receive terminals for bomber aircraft. These receive terminals will provide a new communications link for the bomber aircraft that will be unaffected by atmospheric disturbances.

The Automatic Communications Processor program provides major improvements in high frequency [HF] radio communications equipment for timely and reliable communications in support of the worldwide mission of the Military Airlift Command. Modifications to airborne and ground radios will be developed that will improve the performance of conventional assets by adding an automatic frequency management system.

The Strategic Air Command's Automated Command and Control System relies on 30-year old technology. The current system is becoming increasingly difficult to support. It lacks the speed, capacity and routing architecture to meet the command's critical command and control requirements. The SAC Communications program includes the SAC Digital Network and the Aircraft Alerting Communications Electromagnetic Pulse upgrades.

The Strategic Air Command Digital Network [SACDIN] will replace the Data Transmission Subsystem of the command's Automated Command and Control

system. Improvements include automated communications processors, linked together by the common-user Defense Data Network to meet SAC's requirements for high-speed message delivery. Production and fielding of SACDIN begins in fiscal year 1985 with full operational capability scheduled for calendar year 1987.

The Aircraft Alerting Communications Electromagnetic Pulse [AACE] upgrade program will provide shielded enclosures and associated consoles and power supplies for selected equipment at Strategic Air Command main operating base command posts. In fiscal year 1985, we are undertaking AACE full scale development and will conduct developmental test and evaluation. We plan to procure a total of 23 AACE production units in fiscal years 1986 and 1987 and install them during 1987 through 1988.

The Defense Satellite Communications System [DSCS] provides Super High Frequency (SHF) satellite communications for secure voice and high data rate transmissions to support both defense and diplomatic users.

In fiscal year 1984 we initiated an expanded advance buy of parts for seven DSCS III satellites. In fiscal year 1985 we received authority to increase the scope of this contract to a full multiyear production contract. The fiscal year 1986 budget request provides full funding for two of the seven satellites and continues advance procurement for the remaining vehicles.

The EC-135 airborne command post provides an airborne operations center to support continued command and control of our nuclear forces. These aircraft, along with the E-4B, National Emergency Airborne Command Post aircraft, form the basis of the Worldwide Airborne Command Post system.

With the increasing age of the EC-135 Post Attack Command and Control System [PACCS] aircraft and the national emphasis on strategic communications capabilities, the Air Force has developed plans to modernize the aircraft. Additionally, we are currently conducting trade studies and preparing an acquisition plan for phasing in a replacement system.

Major modifications are planned for the EC-135 aircraft in Fiscal Year 1986. These modifications include continuing the ultra high frequency/frequency division multiplex replacement, the initial Milstar transition to satellite communications terminals and the Peacekeeper upgrades to Airbone Launch Control Center Aircraft. Other enhancements to be programmed in subsequent years include the full Milstar capability, Ground Wave Emergency Network terminals, improved Diversity Reception Equipment and installation of the Nuclear Detonation Detection System terminals.

Also in fiscal year 1986, we will begin installation of a Super High Frequency system upgrade for the E-4B Airborne Command Post aircraft. The E-4B will receive the initial Milstar modification as well as Nuclear Detonation Detection System terminals, Ground Wave Emergency Network terminals, and the Diversity Reception Equipment.

STRATEGIC DEFENSE

Mr. Chairman, our strategic defense forces and systems are key elements of our deterrent posture. These forces form the backbone of our ability to warn of aircraft and missile attacks, monitor space activities, and defend against atmospheric and space-based threats to U.S. forces. They insure that our National Command Authority's strategic retaliatory capability would survive any Soviet attempt at a first strike by providing timely reliable, and unambiguous warning, as well as attack assessment and ultimately damage limitation.

Defense of North America against the air breathing threat is a joint U.S. and Canadian responsibility under the North American Aerospace Defense [Norad] Command. Strategic air defense forces must provide timely, credible tactical warning and defense against enemy bombers, air-to-surface missiles and cruise missile attacks. These surveillance and defense forces control access to North American airspace in peactime.

No longer is the Soviet air threat confined to high altitude bomber attack. Their capability has increased with the introduction and continued production of Backfire bombers and improved air-to-surface missiles. New cruise missile-carrying Bear bombers are being produced. In addition, a new strategic bomber, similar to but larger than our B-1B, called the Blackjack, is expected to become operational during the 1980's. It will also have a cruise missile capability.

More significant is the development and near-term deployment of cruise missiles. The Soviet air and sea launched cruise missiles are the most severe threat to our capability to insure adequate atmospheric tactical warning is provided to the Na-

tional Command Authority. The modern threat has generated renewed interest in air defenses and the need for modernization.

Our planning for comprehensive modernization culminated in 1982 with a North American Air defense Master Plan. This plan guided our acquisition strategy for fielding more capable air defense forces in the 1985–95 era. Under the lead of the Norad Commander, the plan was updated and a long-range planning annex completed. The master plan and annex provide guidelines for deployment of a modern air defense system.

Most of our operational air surveillance and defense systems were designed and deployed in the 1950's to meet a medium-to-high altitude bomber threat. Over the years, force cut-backs have significantly reduced the number of our radars and interceptor aircraft. Against today's low-altitude bomber and cruise missile threat, the capabilities of these systems are limited to very short ranges. These systems are also becoming increasingly expensive to operate and maintain.

To warn of an air attack today, we have only the Distant Early Warning radar stations across northern Alaska, Canada, and Greenland, the Joint Surveillance System radars around the periphery of the continental United States and some new radars in Alaska. We now have a modern command and control capability for these radars and fighter forces with the deployment of the Region Operations Control Centers.

New systems are being developed to overcome our current weaknesses. Dual emphasis has been placed on improving performance against the modern Soviet bomber and cruise missile threat and reducing the cost of ownership.

The Over-the-Horizon Backscatter [OTH–B] radar will correct many deficiencies of the current surveillance network. The OTH–B radar provides long range, all altitude, wide area surveillance. The Air Force plans to deploy four OTH–B radar systems. The east coast system will provide surveillance of the Atlantic from the Atlantic from the Labrador coast (where it links to the DEW line replacement, the North Warning System) to Florida. The initial sector of the East Coast radar system will be delivered to the Air Force in fiscal year 1986. The remaining two sectors will be delivered in fiscal year 1987. In fiscal year 1986, we will begin procurement of the west coast radar system to provide surveillance of the Pacific Ocean area from Alaska to Mexico. This system will be procured in fiscal years 1986 and 1987. The third OTH–B radar system will be located in the Central United States. This system will link the East and West OTH–B radar systems. It will provide surveillance of the southern approaches to the United States and will cover Atlantic and Pacific Ocean areas inside the 500 mile minimum range of the east and west coast systems. The fourth system will provide air surveillance of the North Pacific for air defense of the Aleutian Islands. The Central and Aleutian systems will be deployed in the early 1990's.

In the north, the existing line of Distant Early Warning [DEW] radar stations will be replaced to provide credible long range all altitude coverage to complement OTH–B surveillance. The 31 existing DEW Line radars are old, expensive to operate and maintain, and deficient in coverage and radar performance.

The new system, called North Warning System, will consist of a total of 52 radar stations: thirteen long range, minimally attended radars and 39 short range, unattended radars. Upgraded communications to interconnect the radar stations and transmit data to the Joint Surveillance System Region Operation Control Centers is also part of the new program. Development of the new short range radar began in 1984, while production of the long range radar is continuing. Field deployment and site construction is being done under a new joint venture with Canada.

In fiscal year 1986, communications upgrades will begin and development of the short range radar stations will continue. Both the OTH–B and NWS radars will provide a capability to detect and track long range cruise missiles.

Air defense surveillance to support our deployed forces outside of the Continental United States [Conus] has become a major complementary effort to North American defense. In fiscal year 1986 we will continue to enhance radar surveillance and command and control in the North Atlantic region as a part of the Surveillance Radar Station/Sites Program. We will also begin improvements to our capability for air surveillance in the Caribbean region.

Beyond 1990, the emphasis in air surveillance will be the deployment of survivable systems to meet the growing Soviet threat. In fiscal year 1986, the Air Force will continue development of the critical technologies applicable to airborne, groundbased, and space-based sensors for an advanced air surveillance system that will meet this evolving threat. In the Missile Surveillance Technology and Atmospheric Surveillance Technology programs, we are emphasizing feasibility demonstration of concepts for wide area detection of advanced aircraft and cruise missiles

through all phases of conflict. These efforts support the recently completed long-range plan for strategic air defense formulated by the commander of the North American Air Defense Command.

The program to modernize our Strategic Air Defense capability includes adding F-15's and F-16's. With its long-range radar and look-down, shoot-down capability, the F-15 will substantially improve our air interceptor force. The F-16 will replace the aging F-106's and be used by the Air National Guard for strategic defense. We will use the E-3A Airborne Warning and Control System [AWACS] to ensure survivable surveillance and to meet command and control requirements for the air interceptor forces.

Fifteen air defense interceptor squadrons will continue to maintain ground alert at sites around the periphery of the continental United States. Alert aircraft are employed, in response to radar detections, to intercept and to visually identify unknown intruders. Supported by AWACS aircraft in crises or wartime, these forces provide a limited defense of the continental United States.

By the end of fiscal year 1988, F-15 and F-16 air craft will have replaced the remaining F-106 aircraft in the active duty interceptor squadrons. This will result in an air defense force composed of four active and eleven Air National Guard squadrons. These improvements will greatly enhance the defense against bomber and cruise missile attacks.

To complement our defense against the atmospheric threat a network of sensors provide our National Command Authorities with ballistic missile attack warning and assessment. These sensors include space satellite systems; Ballistic Missile Early Warning System sites in Alaska, Greenland, and the United Kingdom; the Perimeter Acquisition Radar Attack Characterization System [PARCS] radar in North Dakota; sea launched ballistic missile detection and warning sites [Pave Paws] in Massachusetts and California; and the AN/FPs-85 and AN/FSS-7 submarine launched ballistic missile detection radars in Florida.

These systems provide warning of missiles launched from all fixed-site Soviet intercontinental ballistic missile launch areas and areas historically patrolled by ballistic missile submarines in the northern hemisphere. However, Soviet ballistic missile capabilities have improved to the point that we must upgrade our existing BMEWS radars and deploy new Sea Launched Ballistic Missile [SLBM] warning systems to insure adequate coverage and meet the modern, multiple reentry vehicle long range threat. Several modernization efforts are in progress to give us the capability we need.

To accomodate the increased Soviet sea launched ballistic missile threat, two new Pave Paws radars are now under construction in the southeastern and southwestern United States. When these sites become operational, they will join the existing Northeast and Northwest Pave Paws radars and the Perimeter Acquisition Radar Attack Characterization System in North Dakota to form a five site phased array SLBM radar warning network. This network will provide 360 degrees of warning coverage around the United States, and also allow us to close the older, less capable AN/FPS-85 and AN/FSS-7 SLBM radars currently in use.

In fiscal year 1986, efforts will continue on these new Pave Paws radars at Robins Air Force Base, Georgia and Goodfellow Air Force Base, Texas. Warning capability improvements will be added to the existing Pave Paws radars at Otis Air Guard Base, Massachusetts and Beale Air Force Base, California in fiscal year 1987. Satellite tracking capabilities will also be added to the Robins site.

The Ballistic Missile Early Warning System [BMEWS] modernization program is replacing existing 20 year old conventional radars at the Thule AB, Greenland, site with a new solid-state phased-array radar. The new system will become operational in late 1986. This will improve system performance and capacity and provide better pre-impact assessment. In fiscal year 1986, we will also begin a similar modernization at the Fylingdales, England BMEWS site.

Our current space surveillance system is composed of three Ground-based Electro-Optical Deep Space Surveillance [GEODSS] stations and a number of dedicated and contributing radar stations. Against today's threat the space surveillance systems must be upgraded to provide improved low-altitude coverage, high altitude detection, and an ability to report space events in a timely manner. The current command and control functions provided by the Norad Space Defense Operations Center are essentially manual and require improvements to support timely coordinated responses to potential military conflicts.

Our space surveillance and space defense programs will improve surveillance, increase survivability, develop an antisatellite system and enhance selected C^3 elements. The Spacetrack program will improve our ability to monitor space activities. Surveillance is the key to our space warning and defensive options, and we are pur-

suing several near-term efforts to upgrade that capability in our Spacetrack program. In fiscal year 1986, we wil begin equipment installation and testing at the GEODSS site in Diego Garcia; that site will become operational in fiscal year 1987. The five-site GEODSS system providing global deep space surveillance will be completed in fiscal year 1988. Also in fiscal year 1986, we will begin construction of the facilities for the fifth site in Portugal which will become operational in fiscal year 1986. We also plan to improve Spacetrack by refurbishing radar sensors completing the Pacific barrier by deployment of an existing radar at Saipan and improving radar calibration for support of our future antisatellite system.

For the far term, our space surveillance advanced development efforts are meshed with the President's Strategic Defense Initiative [SDI]. The Air Force goal is to deploy by the mid-1990's, a survivable space surveillance and tracking system which will provide full earth orbit coverage, reduce dependence on overseas basing of sensors and provide timely, operationally-responsive coverage of objects and events in space. These Air Force surveillance requirements are incorporated into the SDI technologies development plan. When the technology has matured in the SDI program, it will be transferred to the Air Force and a system will be developed and deployed.

The Space Defense System program continues to develop a low-altitude, air-launched miniature vehicle antisatellite system. The primary purposes of a United States antisatellite [ASAT] capability are to deter threats to space systems of the United States and its Allies and, within such limits imposed by international law, to deny any adversary the use of space-based systems that support hostile military forces. We plan to initiate low rate initial production in fiscal year 1985 and continue production in fiscal year 1986 with the purchase of the second lot of ASAT missiles.

Command, control and communications are vital to effective integration, coordination and management of all space defense resources. The North American Aerospace Defense Command Cheyenne Mountain Complex Space Defense Systems program will develop the Space Defense Command and Control System in a phased approach to support the evolving space defense elements. During fiscal year 1986, the Space Defense Operations Center phased development will continue. An automated capability is being developed to support our space surveillance and space defense program.

The Defense Support Program is a key element of our Nation's strategic defensive posture. This program provides data to the National Command Authority, North American Aerospace Defense Command, and Strategic Air Command. Our development efforts are aimed at increasing the survivability of operational data through design of ground station modifications. These stations will be made compatible with the survivability improvements of follow-on satellites.

To meet near-term requirements, four Defense Support Program satellites have been procured, two in fiscal year 1983 and two in fiscal year 1984. In fiscal year 1986, we will take delivery of the first of these satellites and continue integration of the DSP satellites with the Space Shuttle and continue ground station compatibility modifications. The Defense Support Program is also planned to be dual launch compatable with the Complementary Expendable Launch Vehicle. In addition, we will complete testing on all mobile ground terminals.

Mr. Chairman, three Air Force space programs, the Defense Meteorological Satellite Program, the Navstar Global Positioning System, and the Nuclear Detonation Detection System are unique in their support of a broad spectrum of missions for the Department of Defense.

The Defense Meteorological Satellite Program [DMSP] is the Department of Defense's single most important source of weather data. The program is a joint service support program with the Air Force serving as executive agent. DMSP provides total earth coverage of meteorological, space environmental and oceanographic data to Air Force and Navy forecasting centers. In addition, it directly transmits real-time local meteoroligical and oceanographic data to Air Force and Marine Corps transportable terminals and Naval carrier based stations.

The major DMSP effort in fiscal year 1986 effort will be the continued design and development of an upgraded imaging sensor and the initial development of the associated Titan II Space Launch Vehicle qualified spacecraft. Production of new advanced mobile tactical transportable weather terminals for the Air Force and Marine Corps will continue. Further, the Satellite Control Facility antenna system at the Thule AB, Greenland tracking station is being modified to receive and transmit DMSP command and control and data signals as well as continuing to support other spacecraft.

The Navstar Global Positioning System [GPS] is a space-based radio navigation system which will provide Joint Service users highly accurate three-dimensional position, velocity and precise time under all weather conditions on a worldwide basis. When fully operational at the end of 1988, GPS will enable land, air, and sea forces to navigate with extremely high accuracy and be independent of limited-range terrestrial-based navigation aids. GPS will significantly improve the probability of target acquisition, low-level navigation to and from the target, flexible routing and, most importantly, the accuracy of weapons delivery. In addition, a civilian version of GPS will also be available for worldwide use. The GPS system includes a space segment, a control segment, and user equipment. Successful development led to the award of a multiyear production contract for 28 satellites in fiscal year 1982.

In fiscal year 1986, we are requesting funds to continue the GPS multiyear contract. Those funds will be used to complete the purchase of nine satellites and continue advance procurement funding for the remaining 12 satellites. The first GPS production satellite launch is planned for late 1986. We will also initiate deployment of the user avionics, which will ultimately be installed in most Department of Defense aircraft. Also included is the continued funding of the five-satellite research and development constellation to support mapping, missile testing and avionics integration testing.

The Nuclear Detonation Detection System [NDS], also known as the Integrated Operational NUDET Detection System [IONDS], consists of a set of sensors that will be carried on Navstar GPS satellites. When used with the precision frequency standards of the GPS, these sensors will determine nuclear detonation location, time and yield.

Prototype sensors are operational on three GPS developmental satellites. In fiscal year 1986, we will continue development of the NDS user terminals and acquisition of the operational satellite segment. A full NDS capability will be achieved in 1988 when the GPS satellite constellation is in place.

Mr. Chairman we believe our space program efforts and the formation of Space Command are major steps toward providing the enhancements necessary for maintainging our national objective of deterrence of hostilities to the US and its Allies and a more peaceful, stable global environment.

Mr. Chairman this concludes my formal statement. We will be pleased to accept any questions the committee may have.

Senator WARNER. General Brandt, do you have a presentation or are you here to respond to inquiries?

General BRANDT. Sir, I am here to answer any question you might have relative to the formation of the Unified Space Command.

Senator WARNER. Why don't you take us through where you are today.

General BRANDT. Basically, we are on schedule in our planning for forming the new command. On the 20th of November 1984, President Reagan approved the establishment of a Unified Space Command.

Subsequently, on the 3d of December Secretary Weinberger directed the Joint Chiefs of Staff to proceed with the planning for establishing the command on October 1, 1985.

I am pleased to report today that we, in my judgment, are on schedule in this planning process which basically is a time-phased series of milestone decisions. Initially the Joint Chiefs have been addressing the major missions and responsibilities to be assigned to the new Commander in Chief of the Unified Space Command.

We now have the vernal equinox upon us. We are at the end of that initial process of shaping the responsibilities. From that will evolve the major organizational decisions: what service will support this command as the executive service, through which resources for operating the headquarters are obtained: where, and I know Senator Hart might be interested in this, where will it be located?

And I will be happy to report there is no question, Colorado Springs is one of the prime candidates that the Joint Chiefs are looking at because of the very robust infrastructure of resources already in place, both in Cheyenne Mountain and at the new Consolidated Space Operations Center.

Those kinds of decisions will be coming in the weeks ahead so that hopefully as the springtime ends all of the organizational major decisions will be finalized as we go into the definitive transition planning to meet that date in the fall.

Senator WARNER. What is the date?

General BRANDT. October 1, 1985. That would be the original implementation. We would envisage this coming fiscal year to be a transition period in which the decisions taken are fully implemented and again an orderly transfer of responsibilities to occur in that coming fiscal year.

Senator WARNER. It would certainly be the hope of the Congress that this new Space Command would produce some efficiencies not achievable at present.

Will there be some efficiencies achieved?

General BRANDT. Yes, sir, in my judgment, there will be efficiencies and effectiveness achieved that are not currently available because the new command should serve both U.S. and allied interests by providing that centralized organizational structure for military operations which we have not had in the past. That should lead us to opportunities for effectiveness and efficiency in the future as a result.

Senator WARNER. I know it is a tough question in view of your colleagues being present, but it must be asked.

Is this proceeding on schedule and in a manner that it is receiving full support from all three services?

General BRANDT. Yes, sir.

The Joint Chiefs of Staff unanimously recommended to the Secretary of Defense that such a command be formed. I am getting good cooperation. I have a staff that is composed of members from all the services, Senator Glenn, including several marines who are doing super jobs for me.

Of course, we are looking to serve the needs of all our Unified and Specified Commanders around the globe.

Senator WARNER. Do you perceive any special requirements legislatively?

General BRANDT. No, sir, not in the short term I do not. Nor do we see or anticipate anyone coming for major reprogramming actions or major incremental resources requests as a result of this action.

One of our ground rules is, in effect, on the resource side we try to play a zero sum game, if you will. In other words, minimum impact in the short term in particular.

Senator WARNER. Now, the target date of October 1, 1985, coincides with the beginning of the new fiscal year.

How would you view a fencing arrangement by the Congress of funds subject to the creation of that new command on the target date?

General BRANDT. Sir, I don't think it would be necessary really. Again, our planning is on schedule. We would not like to see any

programming and any actions relating to the current fiscal year budget to be impeded.

Senator WARNER. Senator Hart?

Senator HART. General, I was puzzled to hear you say that the decision on location or siting has not been made. I was under the impression that it had been.

General BRANDT. No, sir, not by the Joint Chiefs of Staff. Again, the organizational decisions are going to immediately follow, putting the responsibility question to bed.

Again, I have spent a substantial amount of my career in the space business in Colorado Springs, in that area. Certainly it is a very, very credible military capability on the space side that has evolved over many years.

Senator HART. When will that decision be made?

General BRANDT. I would believe, again in my judgment, in the springtime, perhaps as early as the end of next month that will all be resolved.

Senator HART. Anything I can do to encourage you, I want to do so.

General BRANDT. Yes, sir.

I can tell you that I am very encouraged myself personally. We have looked at the space resources in the country. Again, we want to get full conscious addressal by the Joint Chiefs. That is going to happen. I am sure they will see the prudent wisdom and reality of that circumstance.

Senator HART. If those standards are used, there is no question where you will end up.

General BRANDT. Yes, sir.

Senator HART. What will be the impact on the existing Space Commands at the service level?

In other words, once consolidation occurs, what happens to the individual Service Space Commands?

General BRANDT. I don't see any major changes in the short term in the individual service responsibilities, in that the Unified or Specified Command is established under Title 10. It normally has components from various services.

I fully anticipate that that is recognized by the Joint Chiefs. The natural components of this command initially would be Commodore Truly's Naval Space Command at Dahlgren and Air Force Space Command at Colorado Springs.

Senator HART. What I am trying to determine is roughly the number of people in those individual Space Commands and the number of people that will be involved in the consolidated operation and the degree to which the two will overlap.

General BRANDT. Again, the precise decision relating to that has not been made. Commodore Truly mentioned his staff is relatively small, on the order of 75.

Commodore TRULY. We have 72 people on board in the headquarters Naval Space Command.

General BRANDT. The Air Force Space Command is significantly larger. Of course, they serve a dual purpose quite often with the Air Force Space Command at ADCOM today.

Again, as a ballpark figure, the size of the unified staff is on the order of several hundred, depending on what they would approve,

probably somewhere between 300 or 400 perhaps as the people designated for the unified headquarters function.

We would see all of those initially coming from being reprogrammed for the service resources to do that job.

Senator HART. Is there such a thing today as an Army Space Command?

General BRANDT. No, sir. There is an Army element related to ADCOM that focuses on space. There is also an Army space program office here in Washington and the Army as a user of space has great interest.

Senator HART. The two principal services are Air Force and Navy?

General BRANDT. Yes. I would think initially the Army participating in the Unified Space Command would participate with Army elements, if you will, not a full component.

General BEER. The Army staff has established a small cell in Space Command. We would anticipate they would be a headquarters element more than a component command. We would expect in the neighborhood of 150 to 200 additional people in the command at Colorado Springs, not a very large addition.

Senator WARNER. Senator Cohen?

Senator COHEN. Commodore, in your statement on page 6 you indicated that a major thrust of the Naval Space Command support charter is to: Assist the fleet in minimizing the impact of Soviet surveillance upon U.S. naval operations. To do this we must understand both our own capabilities and vulnerabilities as well as those of the Soviets.

Assistant Secretary of Defense Burch is quoted in an article in National Journal last month as saying:

> It is easy to say that since the Soviets know where our ships are, why isn't the American public entitled to know? Maybe the Soviets know and maybe they don't. There is a question of how effective their Rorsats really are. By some standard they are sort of crude. With our technical capability we have never been able to put up a satellite system to track ships.

Do you want to comment on that statement?

Commodore TRULY. Sir, if I may, can I respond to that in closed session?

Senator COHEN. If I am still here. I just want to know what your assessment is of statements made publicly, both in your open statement and also in Secretary Burch's observation about Soviet surveillance activities.

One other question I have on GEOSAT on page 9, you indicate that it "will allow a significant reduction in sea-launched ballistic missile error budget."

When you say significant reduction in SLBM error budget, do you mean reduction from current C-4 levels and current D-5 estimates?

Commodore TRULY. If I may, I would ask Admiral Ramsey, our Director of Space Systems to respond.

Admiral RAMSEY. I am here to fly high cover for Commodore Truly.

The error budget that will be impacted and improved is for both the C-4 and the D-5 missiles.

Senator COHEN. In other words, this information would have utility for the C-4 as well?

Admiral RAMSEY. Yes, sir.

Senator COHEN. Is it beyond the D-5 estimates, something we have been told for years now this is going to improve?

Is this something in addition to what we have been told in the past?

Admiral RAMSEY. Yes, sir, I believe it is. It is an additional improvement. We won't realize the significance of the improvement until we process the data we accumulate from the GEOSAT. That is going to be an 18-month effort.

Then the data will be available to be followed into our software development for the missile system.

Senator COHEN. I have a couple other questions I would like to ask in closed session.

That is all I have, Mr. Chairman.

Senator WARNER. Senator Glenn?

Senator GLENN. Thank you, Mr. Chairman.

Following up on what I indicated as my original question here, I don't know whether there is any specific significance to this or not, but I notice in going through Commodore Truly's testimony for the Navy here that the words "Air Force" do not seem to creep in anywhere except in reference to the Air Force Milstar, the specific system.

On the other side, General Beer, I notice in the Air Force testimony that the word "Navy" never seems to get mentioned in your testimony. I could not find a single reference to Navy in reading through here rapidly except in reference to a specific system of some kind.

I have seen the programs from both ends, and granted, my experience when I was a user in the space system, which is ancient history by now, but I have followed it closely through the years and I can tell you on Capitol Hill there is a feeling that this uncoordinated activity is remaining as uncoordinated as it has been in the past.

I think it will hurt both your commands unless we get it straightened out. I am being blunt about it.

There is a feeling that the Air Force is trying to gobble up all its stuff and Navy is trying to carry off things for itself.

Now, briefings we have had in the past have done little to allay my fears that this is not exactly what we are doing, and wasting a lot of money along with it.

I would like to have you both address it and then I have some follow-up questions along this same line.

As follow-up on this right now, in the planned exercises, Commodore Truly, is it going to be tied into Norad? Are they going to be part of this whole thing?

General Beer, the Navy capability, all the things we have to look at, are not included in this, the early warning for ships at sea. We talked about Over-the-Horizon Radars, our gaps there. Nothing is mentioned about ships at sea, their radars, their airplanes out there, how they are tied into this whole thing.

Address that whole issue, will you? Because I think this is an area that is of increasing concern here on the Hill. It has been of increasing concern to me through the years.

I don't think we are on first base yet to getting the cooperation between the services if this physical thing is going to work in a tough combat situation, and that is the only reason for having it.

Who wants to go first?

Commodore TRULY. Sir, I think you ask some good questions.

Addressing the first question you mentioned the written statements. This has been a very interesting year in the country with formation of the Unified Command going on. As the Commander of Naval Space Command, and knowing that General Brandt was here representing the Joint Chiefs of Staff, I felt that it was inappropriate for me to testify to you except for those systems and responsibilities that I am directly responsible for and understand.

So, that is the reason why I stuck to the Naval Space Command because I felt that is what I could testify accurately to.

On your point about Navy programs and Air Force programs, however, I must point out that almost every space program, as you know, that the DOD runs today really is a joint program and there is a tremendous amount of cooperation between all the services as users, while one of the services is designated the executive agent of the program.

For example, in Milstar the U.S. Air Force is the executive agent, but I can assure you that there are members of my staff who almost on a weekly basis participate in Milstar planning, and so forth, and the reverse is true, too.

As far as exercises, it sort of depends on what the exercise is. The Naval Space Command, since we are young, just participated in our first JCS exercise in the past several weeks. That one did include CINC Norad, all the theater CINC's, and the JCS.

As I pointed out in my statement, the Naval Space Surveillance System which has been operating down at Dahlgren, VA, since the early 1960's is an integral part of the Norad space surveillance network.

I guess my only other comment would be that at a working level during this first 17 months of the Naval Space Command's existence we have had excellent relationships with the Air Force Space Command in Colorado Springs.

It is not quite to the point in the JCS process yet for the services to nominate Service component commands, but Admiral Watkins has indicated several times it is logical that the Naval Space Command would be the suitable component of the Unified Space Command, and assuming that it goes that way, we stand ready to become that naval component, representing both the Navy and the Marine Corps.

Senator GLENN. General, would you care to comment?

General BEER. My comment is essentially the same thing. My presentation here was on the Air Force Space Command which is a major command just within the Air Force.

While Commodore Truly and I talk about a number of things, I am the planner and also a director of operations and work with the Naval Space Command. Indeed, I did not see the need to show any of those linkages or provide any examples.

I am in the process now of identifying Air Force Space Command planners to go down and join Commodore Truly's staff. There is no lack of cooperation and no lack of good will between the two commands.

It is just for our briefings in the open session we were asked just for the organization that we represent.

Senator GLENN. My question was not based solely on the testimony this morning. When I get briefings from the Navy or briefings from the Air Force, there seems to be a tendency along this line, that the service, the one we are briefed on, the tie-ins that would be necessary in combat in a wartime situation are usually not there unless we ask about them.

I am aware of the inter-service rivalries over the years. I hope whatever we do on this is coordinated because if it is not, we are wasting a lot of money, including our combat capability. That is more important than wasting money.

Let me give a specific on this Minimum Essential Emergency Communications Network that is planned. I understand that is basically nonjammable or we think it is anyway.

Does that tie in with the ELF for submarine control or is ELF tied in, in any other way, as a backup for Air Force communications?

That is just one example. Are these things all tied in together or can they be tied in together?

General KUTYNA. Let me talk about some tie-ins we have. The Air Force launches the great majority of the Navy systems. For launch systems there is great cooperation. The Air Force launches most of the Navy systems. The FLEETSAT system, however, is a Navy system. We fly as a tenant on their satellite with the AFSAT communication system. We develop the satellite for them.

The Navy develops the ground terminals and recently the Electronics System Division asked the Navy to develop their future ground terminals for Air Force UHF Satellite communications.

In the Milstar system, again close cooperation in terminals and satellites. As a matter of fact, when I left the Space Division, the deputy program manager of the Milstar program was a naval officer.

For Over-the-Horizon Radar, when I was with ESD working on an experimental system, we did an experiment for the Navy in detecting ships at sea which was very successful.

Space-based radar, Admiral Ramsey and I are working on that jointly and trying to put in a coordinated plan.

With respect to the follow-on UHF satellite, the Navy is leading the charge on what the requirements are. However, the Air Force is flying close wing on them. Again, a very cooperative program.

GPS, Global Positioning System, their ships are doing some of the initial tests with our experimental satellites and find it very satisfactory.

The cooperation in the R&D world is extremely close.

Senator GLENN. I am glad to hear that.

How about operationally? How about a carrier task force going from the Atlantic to the Pacific?

Are they tied into the Norad net?

Commodore TRULY. The Naval Space Surveillance System gives routine reports as requested to battle groups or individual units directly from Dahlgren to ships or groups at sea which is based on the overall Norad space catalog.

Senator GLENN. Is this tied in on a moment-by-moment basis with Norad so that if something came over the horizon that ships picked up before Norad did, you would know it and operate on it?

Admiral RAMSEY. Senator, the answer is yes.

Senator GLENN. Does Norad agree with that?

Admiral RAMSEY. May I expand on that in closed session?

Senator GLENN. Yes, I would like you to do that.

You did not answer my question, is the MEECN tied into the ELF so that they are dual reinforceable?

General KUTYNA. I have to answer that for the record. I am sure there is a tie.

[The information follows:]

MOMENT-BY-MOMENT BASIS WITH NORAD

MEECN and ELF are complementary systems tied together through operational command and control. Due to the limited data rate available over the ELF system, ELF is not capable of or designed to communicate messages for detailed force command control. The ELF system acts as a "bell ringer" that notifies the submarine to come to a position where it can receive the MEECN messages. Then, Air Force and Navy MEECN links are used by operational commanders to direct the submarines.

Senator HART [presiding]. Senator Exon?

Senator EXON. Thank you, Mr. Chairman.

We talk about our whole space system tied in so closely with our ground- and sea-based facilities, gentlemen. I want to pursue one thing.

TRIDENT

We talk here among ourselves about the MX, the Trident, the D-5 and the black programs. Within the last two days I was in two meetings with regard to the MX controversy. The matter keeps popping up that some people in some branches of the Armed Services are questioning the survivability of even the Trident submarine. They were concerned that a Soviet breakthrough in ASW would negate the value of the Trident fleet.

I have two questions related to Trident. How are we coming and what progress are we making in ELF or other types of communications with submerged submarines? How far do you see into the future that we could be reasonably confident of the survivability of that force?

Let us start with the Air Force and then let the Navy rebut or add thereto.

General KUTYNA. I can't comment on the submarine communications system. I can comment on the satellite systems and in closed session we can go into details.

We are improving the satellites themselves to be more survivable to provide service to the Navy and Air Force.

From a survivable point of view the communications links are very vulnerable. They will be secured in our future systems for all three services.

Again, the ground command posts, and ground processing stations will be made survivable by making them mobile, by proliferation and other means, like hardening. From all aspects and in the tri-Service programs we are trying to do our part to make sure they are survivable.

I will have to leave the ELF questions to the Navy, however.

Senator EXON. General, I understand your answer and I appreciate your straightforwardness. I think maybe your answer brings home a concern that this Senator has with regard to the overall cooperation and understanding.

When we are talking about the space command, we are talking about relationships with systems not just in space, but the whole communications systems that goes throughout our national security forces.

Is that as far as you or any Air Force officers can go with regard to your knowledge on communications with submarines?

General KUTYNA. That is as far as I can go at this moment, sir.

Senator EXON. What can the Navy add to this?

Admiral RAMSEY. I think our Air Force contemporaries are being put on the spot because they are probably not in that field of being assured of connectivity to the submarine force.

Senator EXON. That is exactly what I am trying to do, to put them on the spot, not to be critical of them, but to bring home the point Senator Glenn is making.

Unless we have an overall strategy, an overall understanding, we will be in trouble. We can't compartmentalize the defense of this nation. I am very fearful that we are doing that over and over again as a result of interservice rivalry.

What I am trying to bring home to you gentlemen, is that I think it is time we take the military structure, shake it, and say we are spending billions and billions of dollars without the right hand knowing what the left hand is doing.

Now, I say that to try to bring the message home to you that we don't want business as usual. We don't want this service taking care of this particular area and this service going over here and taking care of that.

If we are going to have a Unified Command in space, it has to be a unified command.

Maybe the Air Force does not understand all the details of Navy operations and communications, but unless there is a general thread of understanding through all of this, we are all in trouble. For example, unless I have some basic understanding of what is going on in other parts of the armed services over which my subcommittees do not have primary jurisdiction, I can't begin to make intelligent decisions as to what I should do with authorization and procurement in those areas when I have to vote on them.

I just wanted you to understand what I was saying.

Admiral RAMSEY. We have a Strategic Connectivity Committee in the Department of Defense and there are representatives from the Air Force, Navy, Army, and JCS staff as well as CSD staff who are all part of that committee and are very, very knowledgeable of the interconnection and interoperability requirements.

I, for the Navy, do not feel qualified to speak in detail about our strategic connectivity. Rear Adm. Larry Lehman in the Navy would be the proper individual to speak to that.

ELF, as you know, the initial site is operational and in testing at this time. Additional strategic connectivity to our submarines consist of ELF, low frequency, and TACAMO aircraft.

There are interconnections with our strategic satellite communications to all elements as backups for the transfer of vital information to those. I believe that we are addressing additional security for our strategic reserve force and looking very carefully at the development of a satellite laser communications capability in conjunction with DARPA that may provide a laser communication to submarines at submerged depths.

We can certainly pursue that in more detail in closed session if you would like.

Senator EXON. Admiral, in your view, how far have we come in the last 3 or 4 years on communications with our submarines?

Admiral RAMSEY. We would like to be able to exploit the covertness of the submarine force to its ultimate potential. One of the ways to do that is to ensure that they never have to stick anything above water or trail anything behind them. The satellite laser communication looks like it may provide the potential for us to exploit that capability.

The ELF is another attempt to keep the submarines at submerged depths where they can receive information without having to perhaps expose themselves.

So, yes, we do want to exploit the communications potential and provide a more secure base for that strategic reserve force.

Senator EXON. My question was: How are we coming? What kind of progress have we made in the last 4 years?

Admiral RAMSEY. ELF, as I mentioned, is in testing. It looks like it is providing very secure communication. When we get the other site on line, that will extend the range so that will cover most of our operating areas.

The satellite laser communications is in development with DARPA. We are evaluating our technology and we will probably make a decision in 1988 as to whether to proceed with a full program.

Senator EXON. You can't make the decision before 1988? Is that what you are saying?

Admiral RAMSEY. That is right, sir.

Senator EXON. One final question, Mr. Chairman.

From both of your viewpoints, are we ahead, significantly ahead, equal with or behind the Soviet Union in our ability to communicate with our submerged submarines?

Admiral RAMSEY. May I provide the answer for the record?

Senator EXON. In a classified section?

Admiral RAMSEY. I would prefer to provide it for the record.

[The information follows:]

STRATEGIC COMMUNICATIONS

The United States and the Soviet Union have essentially equivalent capabilities in their ability to communicate with submerged submarines. Both use various elements of the frequency spectrum for redundant communication paths such as very low frequency transmitting sites, airborne emergency communications systems, satellites, high frequency transmitting sites, and extremel low frequency systems.

Senator EXON. I would hope you could give us something in closed session.

Admiral RAMSEY. We can discuss it in closed session.

Senator EXON. Thank you, Mr. Chairman.

Senator WARNER. Senator Quayle?

Senator QUAYLE. I will pass, Mr. Chairman.

Senator WARNER. Then we will have a second round and I will lead off.

Again, back to General Brandt.

CREATING A JOINT COMMAND

Now, under the plan to create the Joint Command, is it my understanding that the commander of it would be on a par with the other CINC's worldwide?

General BRANDT. Yes, sir. That is the intention. He will be a Unified and Specified Commander as authorized under title 10 of the United States Code.

Senator WARNER. This brings me back to my own experience in the Department of Defense in years past. That is, if my recollection is correct, under the code that commander reports directly to the Chairman?

General BRANDT. He reports to the Secretary of Defense through the Joint Chiefs of Staff.

Senator WARNER. I am concerned about this command's slipping into the posture of being a system command.

Do you know what I am speaking of?

General BRANDT. Yes, sir. However, the planning at this stage does not, nor is the intention to assign any service developmental responsibilities to this commander in chief. The commanders in chief are warfighters. They direct the operation of forces assigned.

Senator WARNER. I understand. The budgeting and development and the procurement would still remain under the three services and OSD?

General BRANDT. Yes, sir.

Senator WARNER. There would not be any first cut into the system command?

General BRANDT. That is correct.

Senator WARNER. Air Force division control would clearly be exercised over the budgeting, procurement, and development phases?

General BRANDT. Yes, sir.

Senator WARNER. That answers my concerns.

Senator Hart?

ASAT

Senator HART. I have two or three questions on Asat. I don't know to whom they should be directed.

First of all, what is our present capability to monitor Asat tests?

Are your services assured that we have that capability today?

General BRANDT. We have an excellent capability to monitor the employment of the Soviet Asat.

Senator HART. How would you describe the Soviet capability today to interfere with, if not destroy, our higher system of reconnaissance communications satellites?

General BRANDT. I would prefer to answer any specifics on that in closed session.

My answer in open session would be the Soviets have a very potentially robust capability to interfere with our satellites.

Senator HART. Now, you would agree, would you not, that that kind of interference would require a great deal of coordination and simultaneous acts; in other words, it is not going to do any good to knock out one satellite or two, is that correct?

General BRANDT. If they were doing it in a military sense, all their strategy and doctrine implies that that is the case. It would be fully coordinated.

Senator HART. And they have that capability today?

General BRANDT. They have a capability today that could put the U.S. satellites at risk.

Senator HART. Which of the two sides relies more on satellites for a military role?

General BRANDT. In my personal professional opinion it would be the United States because the Soviets have tended to keep a more robust infrastructure in that they have a propensity not to discard earlier generation systems, things like communications, and so forth.

So, I think our growing military dependence would be to a higher degree than the Soviet Union.

Senator HART. When you say not to get rid of existing systems, you mean land-based systems?

General BRANDT. Yes, sir.

RELYING ON SPACE FOR MILITARY PURPOSES

Senator HART. We are beginning to rely more on space for military purposes than they are?

Is that a fair generalization?

General BRANDT. I think it is a fair generalization. However, over time that gap perhaps will close, too, since they have such a robust space program.

Admiral RAMSEY. Senator, if I may add, there is an interesting trend. As the Soviets become more globally dispersed with their navy forces and also with some of their air forces, we see them depending more on satellite communications for the long haul requirements.

Senator HART. That is interesting.

BAN ON TESTING

General Brandt, would you say that a ban on further Soviet flight tests of antisatellite weaponry would be to the advantage of the United States in terms of assuring the long-term survivability of our space-based assets if we had a verifiable agreement to that effect?

General BRANDT. Sir, I don't see arms control to be in my general area of expertise and also because of all of the undertakings already under way at Geneva, I submit Senator Warner is probably in a better position to answer that question than I.

Senator HART. I am asking for a military judgment, not a policy judgment.

In other words, if there were a mutually verifiable ban on antisatellite weaponry tests, would that be to our advantage from a purely military point of view?

General BRANDT. From a military personal professional perspective, my view is that it would not be.

Senator HART. It would not be?

General BRANDT. Yes, sir.

Senator HART. Is is more in our interest to proceed with antisatellite weaponry than it is theirs?

General BRANDT. Yes, sir, in the short term I am saying that because I do not believe it is in the interest of the United States to allow the Soviet Union a sanctuary in space.

Senator HART. What kind of sanctuary?

General BRANDT. They are the only world power that currently has an operational antisatellite system. I think, in my own personal professional view, this issue of verification and the difficulty it presents, especially in the milieu of space, is just overriding.

Senator HART. You testified that the United States has the capability to monitor Soviet tests?

General BRANDT I said their co-orbital Asat which is launched by the SL-11 from Tyuratan, I think they have a good capability. I did not want to infer that the Soviet Union is limited, in the assessment of the intelligence community, to just that kind of capability.

Again, I am not an intelligence expert, but I do have knowledge, general knowledge, of the Soviet program.

Senator HART. I don't think I have any more time.

Senator WARNER. Go ahead.

Senator HART. The purpose of a ban on testing would not be to offer anybody a sanctuary. It would be a step in the direction of protecting our own satellite communication and reconnaissance capabilities.

It is not to give the Soviets a favor. It is to prevent them from developing the capability to knock the systems out that we so heavily depend upon.

Are we missing each other in the night?

General BRANDT. I think we are ships in the night, sir.

Again, if we are speaking in terms of our own ongoing current development of the F-15 launched MHV, again my view, my personal view, is to assure that we don't allow, if you will, the Soviets, from a military perspective, a free ride or the ability to operate in space.

By our development we are denying that. So, in a sense, it provides us with at least a catchup, a balance, if you will, from a quid pro quo perspective on military capability.

Senator HART. I am talking about freezing things where they are today, if they don't advance their ability to interfere with our capability and vice versa.

Is it more important to us to stop things where they are today so that we protect our existing reconnaissance and communications capabilities or is it more important for us to have the ability to go forward with developing the technology to interfere with theirs?

General KUTYNA. I hate to get between these two ships. The bottom line is that they have a system which is operational. We do

not. If we stop testing today, we wouldn't get one and they would have one.

Senator HART. I guess we are not as far along with the F-15 Program as I thought we were?

General KUTYNA. No, sir.

Senator WARNER. Do you have the ability to verify compliance with a ban on testing in this area?

General BRANDT. Here again, sir, I would prefer to be explicit and say I am not an arms control expert working those issues.

Senator WARNER. We have adequate testimony in the record.

ANTISATELLITE CAPABILITY

Senator QUAYLE. Would you describe for me what is an antisatellite capability?

We talk about launching from the SS-11.

What are all the options in this whole area of the antisatellite weaponry?

If you have already gone through that, I don't want to be redundant. I wasn't here. Did you describe that for the subcommittee?

General BEER. That is a good question. That is where it gets complicated for us to respond to it because what we are talking about so far is what we see today. We see their co-orbital Asat System. We know about our F-15 Asat in the program that is in test.

It gets complicated when you talk about the other kinds of technologies that could be put together to be used in an ASAT role which are the laser technologies, the directed energy technologies and things like that.

It is a tough question to answer because a comprehensive Asat ban is a different thing than talking about the two systems, one we have in test and one they have operational. A comprehensive ban would preclude a lot of things that are in development today that can be used in an Asat role.

So, an Asat can be lots of different things, there is a whole litany of things you can use in an Asat role.

Senator QUAYLE. You don't have a list of present capabilities of the Soviet Union?

General BEER. Not at the unclassified level, sir.

Senator QUAYLE. We will get into it in the classified area.

When we talk about a potential ban on Asat, what are we talking about?

This is my difficulty with it. You can get into lasers, directed energy, or whatever the case may be. You are in a whole host of different options that we are just talking about, whether it is from planes or co-orbital Asat.

General KUTYNA. I can't speak for the Soviet side, but for the U.S. side the F-15 would launch the missile, which would then proceed to low altitude and basically the Soviet satellite runs into that missile; we pre-position, and it runs into it.

Senator QUAYLE. What is the Soviet Asat capability today?

General BRANDT. Again, I would prefer, because this is an open session, to reserve any definitive question until the closed session, but the Soviets have today a co-orbital Asat system that has been

in their inventory for the last dozen years or more and is judged to have the ability to engage and destroy low altitude payloads.

Senator WARNER. I want to move along here.

General BRANDT. We do have from the intelligence community assessments that are available on other elements.

Senator WARNER. I think that is the one system we acknowledge is dedicated to this purpose. As General Beer pointed out, they have done a lot of work in other areas that may have, directly or indirectly, applicability to the situation.

Is that a correct statement?

Senator QUAYLE. That is not terribly conclusive at all.

Senator WARNER. I know Senator Glenn is anxious to have a question and the Chair will have one to follow up.

Senator GLENN. We agree it is a military truism that you learn in every staff school you ever went to when you concentrate your vital essential forces or your control and command facilities, communication facilities, vulnerability in a combat situation increases by quantum leaps.

CSOC

My question is: Are all our eggs in a CSOC basket? Does one shot, one terrorist or one subversive act at CSOC end space control since we are planning a command center next door, as I understand it, although that decision has not been made yet completely, but the space is there.

Are we concentrating our vital control here to the point where we are creating a vulnerability rather than creating a good combat capability?

General BEER. The day-to-day peacetime operation which involves both TT&C, command and control of space systems, but more importantly the command structure, the basic peacetime day-to-day, is housed in an unhardened facility, but that is not true of wartime posture or the planned program or some of the programs already in existence where the CINC and his successors will survive and will go mobile.

Going mobile is also in the architecture of what we need to do with our space systems. That is in our planning.

Senator GLENN. Is the Joint Command Center as you envision it doing the same thing?

General BEER. The Joint Command Center will likewise have to have survivable command posts for the conflict period with connectivity to all the key nodes.

Senator GLENN. I would think that would be an extremely difficult transition. We talked about this a little bit when I was out there last summer. We got into it briefly. I think that would be an extremely difficult transition.

You are accustomed to operate in a central node with all the people involved. When that goes mobile, that will be an extremely difficult transition.

General BEER. There is a tremendous amount of data processed in peacetime that would not have to be processed in wartime. For those essential kinds of messages that need to get through, the essential command and control of space systems has to be there.

Senator GLENN. We can go into this further at a later date because I know we don't have time to go into it this morning.

Your manpower requirements for CSOC, are you going to have pretty high-class personnel and a lot of them?

General BEER. Yes, sir.

Senator GLENN. You are not going to operate with any spies operating up and down the hall, I would guess.

Do you see that as a problem you can address with our current recruiting policies or will we have to have alterations?

General BEER. Presently we plan for a 50–50 mix of military and civilians, including Air Force civilians and contractor personnel, about 50–50. That is going to be hard for us to fill because there is a shortage of space qualified personnel.

Senator GLENN. If war starts and you have to shift to the mobile mode out there, will that be military or civilian contract?

General BEER. The plan for that would be all military. There are opportunities there to involve Reserve Forces, too.

Senator GLENN. That is something I think we might want to pursue at a later date, Mr. Chairman, and go into in more depth. I think this is very important.

It is a most difficult transition when you transition from a peacetime situation, then you go to combat, bang, instead of all the routine there, you are in a new communication net, new control, new command, new interfaces that are extremely difficult.

That is one I would certainly be interested in looking at in more detail at a later date.

Senator WARNER. I think the subcommittee is fortunate to have your interests. I hope you undertake that as a special project in years to come.

I will wrap up with one question.

MOBILITY BETWEEN SERVICES

While we are on the subject of mobility, General Brandt, are you prepared to assure the subcommittee there will be mobility in the rotation of this command between the Air Force and Navy?

Do we want to write that into law?

General BRANDT. Sir, it is not my decision. It is one that has not been made. It will be made in conjunction with the organizational decisions that I referred to earlier and ultimately it will be a recommendation from the Joint Chiefs of Staff that we will all fully participate in.

I can't tell you whether this command is rotational, or whatever.

Senator WARNER. I realize that. I want you to know this. I think I can speak for most of us on this subcommittee, we want to make it very clear it is a rotational command.

General BRANDT. Sir, I heard you and I will remember it.

Senator WARNER. Pass the word.

General BRANDT. Aye, aye, sir.

Senator WARNER. Gentlemen, that was a good briefing.

We will now go into closed session. I hope the room can be secured in less than 5 minutes.

[Whereupon, at 10:53 a.m., the subcommittee proceeded in executive session.]

EXECUTIVE SESSION

The subcommittee proceeded in executive session, pursuant to other business, at 11:05 a.m.

Present: Senators Warner, Quayle, and Exon.

Staff present: Christine C. Dauth, chief clerk; Robert F. Bott and William E. Hoehn, Jr., professional staff members; Russell C. Miller, research assistant; Romie L. Brownlee, assistant to Senator Warner; James M. Bodner, assistant to Senator Cohen; Henry D. Sokolski, assistant to Senator Quayle; Allan Cameron, assistant to Senator Denton; and Jeffrey B. Subko, assistant to Senator Exon.

Senator WARNER. I have been informed the room is secured.

The open hearing was conducted in a professional manner. You are commended collectively.

General BEER. Mr. Chairman, we have two presentations. I have one and General Kutyna has one.

In the interest of time, I know we are scheduled to break at noon, we have taken some steps to shorten both of our presentations.

Senator WARNER. I thank you.

SPACE SYSTEM ARCHITECTURE 2001

General BEER. This then is a report on our space systems architecture study out to the turn of the century to the year 2000.

It is an effort that began over 2 years ago. As a departure point we used what is called the Space Surveillance Architecture, a study we had just finished, that called for improving space surveillance C-band upgrading of existing radar sites which are funded and underway.

The study also called for the space-based surveillance system, called SSTS, now under the SDIO umbrella. That space surveillance architecture, when briefed to Vice Chief of Staff, General O'Malley, he said it was fine, it was well done for space surveillance, but that was not nearly enough.

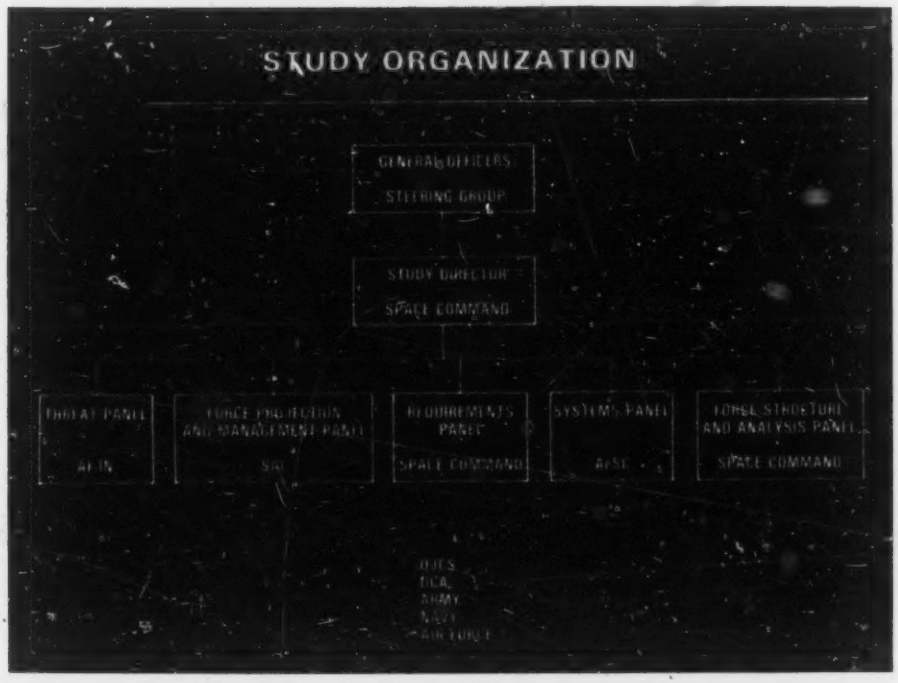
We needed to look at the requirements for all the Services for space systems support and the requirement for survivability, and what can be done to improve that.

So, that was the departure point for this study which commenced 2 years ago prior to the President's speech.

OVERVIEW

Study organization.
Approach.
Threat.
Strategy.
Requirements.
Recommended architecture.
Essential actions.
Summary.

General BEER. This is an overview. I will touch on the study organization, approach and then get into the threat, strategy and requirements that drove the architecture that is recommended in this slide.

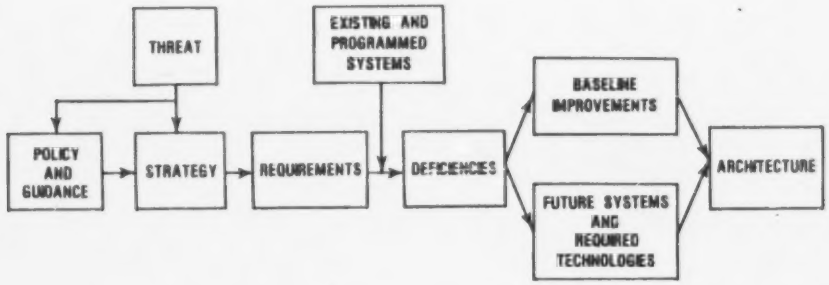


Not to show you what the business of the panels were in this study, only to point out we did have Army and Navy participation, particularly at the General Officers Steering Group level. We had Admiral Ramsey and some other individuals so that we feel that we have captured most of Army and Navy requirements.

I must point out that this study has not been coordinated by either the Army or the Navy staffs.

UNCLASSIFIED

APPROACH



UNCLASSIFIED

This was our approach, to take all the existing policy and DOD guidance and to get the intelligence community's best estimate of the evolving Soviet space threat out to the year 2000.

From that, then, we put together the candidate strategies for the use of space systems. To satisfy the strategies, we identified requirements. We compared that against what is existing in our space system capability and what is programmed through the DOD POM period.

That process highlighted deficiencies to be satisfied in one of two ways, either improvements to baseline space programs or, in a few cases, the development of brand new programs.

Taken together, then, that produced the architecture.

This is to point out to you that times have changed, since 1960 versus how business is done today. In 1960, for example, the primary sensor that we had to do the ballistic missile early warning job was the BMEWS System, still in operation today.

Ballistic missile early warning system radars are located at Clear, Alaska; Thule, Greenland; and Fylingdales, England. Now, our primary source for missile warning is [deleted]. Communications used to go by landlines. Now it goes by Defense Satellite Communications System [DSCS], Navy FLTSATCOM, and AFSATCOM. It is a package, a nuclear hardened package, carried on board the FLTSATCOM spacecraft that allows dissemination of emergency action messages.

For weather it used to be done by air and ground observer, now much of it is done by the Defense Meteorological Satellite Program.

That is the basis of the kind of dependence, the way things have changed.

I am 28 years old—I like to tell people that. The reason I look this way is trying to get folks to understand that space was militarized a long, long time ago.

[Chart deleted.]

Turning to the threat, these four pictures will give you an indication of the magnitude of the Soviet investment in space. This is the Soviet SALYUT space station. You have heard a lot about it.

They do all kinds of military experimentation in terms of [deleted] and other things. The Soviets have over 7 man-years in space, so they are well ahead of us in understanding the utility of military man in space.

We measure our time in space in terms of man-days rather than man-years.

This is a picture of their space plane. It is a subscale model that has now been launched and orbited four times. We think that the full-up version of their space plane will be used for reconnaissance and resupply of the space station.

It can also be used in a space defense role.

Lower left is their space shuttle which is almost identical to ours. The only significant difference is that it does not have the space shuttle main engine [SSME].

The Soviet space shuttle main engines are not part of the shuttle. They rely on a heavy lift booster to get their shuttle in orbit. [Deleted.]

Likewise, this is the first stage of their SL–W which is their heavy lift booster now under development. This booster is estimated to be able to put over 220,000 pounds of payload into low Earth orbit, significantly greater than what our Saturn V was able to do during the Apollo period. [Deleted.] It is so large that there are problems with the transport of it.

Senator WARNER. Why do you suppose the [deleted].

General BEER. We have aircraft that depart the runway surface from time to time. It could be brakes. It could be a cross wind.

Commodore TRULY. If I might comment, directional stability in a cross wind landing is an extremely critical thing that was assessed when we flew the *Enterprise* on top of the 747.

[Deleted.]

[Slide deleted.]

General BEER. These upper two pictures are to give [deleted] the Soviet capability to threaten our terrestrial systems and forces from space.

[Deleted] the Soviet threat against our space systems on orbit. That is the Rorsat, the Radar Ocean Reconnaissance Satellite and the Eorsat that teamed together to pinpoint targeting against naval fleets at sea.

The Rorsat satellite is used for a broad area of detection and the Eorsat gives pinpoint accuracy.

[Deleted.]

There is a laser test facility at Sary Shagan [deleted.]

What are the implications——

Senator WARNER. If I may interrupt, will you kindly provide the subcommittee with what can be said publicly, that is unclassified about Soviet militarization of space?

This comes up time and time again. We debate in a public forum various programs that we have. The American public is still of the opinion that space is pure.

I think it would be helpful to me and to my colleagues.

General BEER. Secretary Weinberger has in the Soviet Military Power publication unclassified a number of things that we used to treat as classified.

For example, the space plane, the space shuttle.

Senator WARNER. This is a forthcoming publication?

General BEER. Yes. The one that is on the street, sir. The two new boosters under development, those are included in that publication.

[Deleted] indeed the Soviets are seeking space superiority. For what it is worth, that is our assessment also; we agree with that.

I would recommend for the subcommittee that you turn to the intelligence analyst to provide you those kinds of assessments.

Senator QUAYLE. Could you give us a general assessment of how you think they will achieve superiority, what technology and what systems will give them superiority [deleted].

General BEER. There is a large number. I am not in a position to run through that.

Senator QUAYLE. It might be interesting to members of the Committee to get that information, where they can go and how they are going to get there.

Senator WARNER. And the resources.

Senator QUAYLE. And what kind of strategy they think the Soviets have to obtain superiority.

General BEER. You are going to get a touch of that on this slide right here. I think you probably need that in more detail than I am prepared to cover.

General BRANDT. [Deleted.] In the course of the last 12 months that has gone through a major update and the new [deleted]. Mr. Casey under whose purview this work goes on would be a valuable source to give you a definitive expert kind of overview on how they come to that assessment of superiority.

General BEER. Sir, in the upper left there is, of course, the terrestrial face-off between our opposing, if you will, military forces.

The fact is that our military forces, to make up for that numerical imbalance, depend heavily on [deleted].

Now, that dependence is well understood by our military forces. Perhaps, unfortunately, it is also well known to the Soviets.

In any event, the implication of this terrestrial threat means that we need high performance, highly capable payloads on orbit.

In the upper right we show two threats here. [Deleted.]

As you know, we have already covered their ability to do lethal interference with their coorbital Asat. The implication of this is that we have to have survivability for those essential spacecraft that we have on orbit supporting these ground forces.

At the lower left, the intelligence community, and this comes from the [deleted].

The implication being we have to be ready to be able to perform, and to continue to perform in a hostile space environment.

At the lower right we have [deleted].

The other facet of this picture is that like us the Soviets do get quite a bit of support and have some dependence on their own overhead spacecraft in support of their military forces. [Deleted.]

Senator QUAYLE. The third one, space-based laser, is that functional now?

General BEER. By 1990 they are expected to have on orbit a prototype space-based laser.

Senator WARNER. What about the space for the rest of the time frame?

General KUTYNA. They do have a ground-based laser that can do damage.

General BEER. [Deleted.]

General KUTYNA. They did orbit a fractional bombardment system in space, did they not?

Senator QUAYLE. Do they have laser capability now?

General BEER. Yes, sir, ground based.

Senator QUAYLE. Have they used that?

General BEER. [Deleted.]

General BRANDT. [Deleted.]

Senator QUAYLE. [Deleted.]

General BRANDT. [Deleted.]

General BEER. [Deleted.]

Senator QUAYLE. We have lost some satellites over the Soviet Union, have we not?

General BEER. No.

Commodore TRULY. I think it is safe to say, to my knowledge, [deleted].

Senator WARNER. Let us clarify the platform that they may have used.

[Deleted.]

General BRANDT. That is correct.

Senator WARNER. But I am left with the impression that they have other installations which are operational elsewhere in the Soviet Union.

Is that the point you are making?

General BEER. In regard to ground-based laser, there [deleted] laser test facility in the Soviet Union that we have knowledge of, [deleted] Sary Shagan.

The laser facility at Sary Shagan [deleted].

That is what we know in terms of ground-based lasers.

In terms of other technologies, you have the wrong witnesses here to give you the current status of the development of those things.

Senator WARNER. Senator Exon?

Senator EXON. Mr. Chairman. I was going to ask the general if he could project how far away they are from having ground-based lasers that could do great damage to our low orbiting systems.

General BEER. I can't give you an estimate of that. I can give you an interesting comment in that regard.

[Deleted.]

Senator QUAYLE. They do now have operational capability on ground-based laser? [Deleted.]

Commodore TRULY. [Deleted.]

Senator QUAYLE. [Deleted.]

General KUTYNA. [Deleted.]

General BRANDT. [Deleted.]

The point to be made, and that is why it is so complex to [deleted].

In looking at all the technologies emerging in the future, it is difficult to look at one with an [deleted] and vice versa.

General BEER. Senator Quayle, if I could point out in this picture right there, that is electronic warfare. It is essential to their doctrine. [Deleted.]

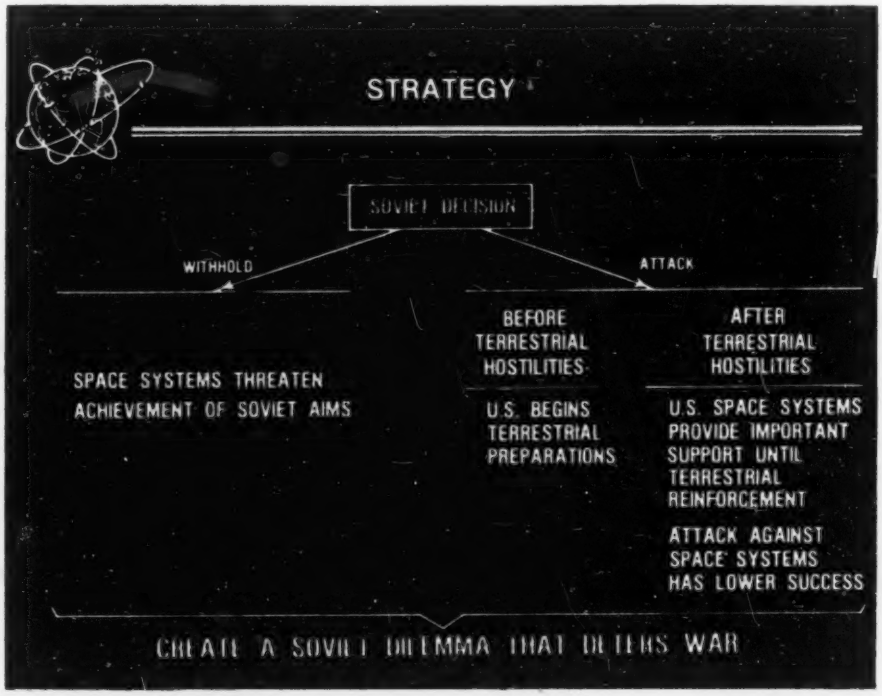
There is no hard evidence, there is no damage that is done. [Deleted.]

So, I don't want you to lose sight that [deleted].

Senator WARNER. With the operation of our satellites?

General BEER. The operation of our satellites.

[Deleted.]


STRATEGY
SOVIET DECISION
WITHHOLD
ATTACK
BEFORE TERRESTRIAL HOSTILITIES
AFTER TERRESTRIAL HOSTILITIES
SPACE SYSTEMS THREATEN ACHIEVEMENT OF SOVIET AIMS
U.S. BEGINS TERRESTRIAL PREPARATIONS
U.S. SPACE SYSTEMS PROVIDE IMPORTANT SUPPORT UNTIL TERRESTRIAL REINFORCEMENT
ATTACK AGAINST SPACE SYSTEMS HAS LOWER SUCCESS
CREATE A SOVIET DILEMMA THAT DETERS WAR

The strategy then that was developed is a dilemma strategy. A dilemma strategy not unlike what exists today for our land, sea, and air forces.

This basically says the Soviets have three decisions they can make. In a terrestrial conflict, they could withhold attack on our spacecraft. We don't think because of the importance of what they do for our forces that is a viable alternative.

The Soviet decision would come down then, to attack our spacecraft after terrestrial hostilities or before terrestrial hostilities start. If they attack after terrestrial conflict commences, they have let us have the warning to get the advanced notice in order to posture our terrestrial forces.

So, they probably would not want to do that; in fact, they would not want to take out our space systems before the terrestrial conflict starts.

That, then, calls for survivability enhancements, defense protection of what we have on orbit so that he really is in a dilemma, betwixt and between.

Senator WARNER. I wonder, the first option.

Under what circumstances might the United States become party to first strike?

Suddenly, if all of our whole system went out, I don't know what the national commander would think.

General BEER. [Deleted.]

If he interfered with the DSP satellite, what would you do with your other military forces? How would you posture to handle those kinds of things?

We are going to be a lot smarter on that in another 3 or 4 months.

[Chart deleted.]

The survivability options that you can exercise are shown from left to right. We go from low cost alternatives to moderate to high cost alternatives.

The left-hand column is a "do nothing more column", essentially what we have done heretofor. That is inconsistent with the strategy and inconsistent with what we have on orbit for our protection.

"Negotiate", could apply to any one of these categories. We believe in negotiation but we believe we have to negotiate from a position of strength.

[Deleted.]

That is the essence of deterrence. [Deleted.]

What are those critical systems?

[Chart deleted.]

This shows the spectrum of conflict. Here we have assessed whether or not there are alternatives to using the spacecraft that you see listed here.

[Deleted.]

[Chart deleted.]

We took the functional area, listed the requirements and then graded ourselves on how well we can satisfy those requirements today.

We then said, with the POM over the next 5 years, in 1990 how well do we satisfy those requirements? Then we let the Soviet threat evolve to the turn of the century, graded ourselves again, and then we identified the architectural solution; either baseline improvements to existing programs, or point designs of new programs.

[Chart deleted.]

In the interest of time, I am only going to show you the surveillance functional area and in surveillance this does not include all of its requirements.

There are about [deleted] requirements just to satisfy the surveillance needs. If I could then focus on ballistic missile launch assessment, these colors as you go across tell a story about how each of these requirements is being satisfied.

[Deleted.]

[Chart deleted.]

This, then, is the architecture. A boost surveillance and tracking system and a space surveillance and tracking system.

[Deleted] in the architecture is Milstar. It is the only one designed from the ground up to be survivable, to be jam proof, and to be secure.

The other systems include, the survivable DSCS, advanced GPS which gives us better accuracy and some improvement in its survivability.

[Deleted.]

This is the only dashed box. It addresses the need for an advanced launch vehicle. We support the complementary ELV program. We expect we will have to have a follow-on CELV program. We have the shuttle. We have SDIO requirements.

We have space station requirements. We need 8 to 10 missions a year to satisfy DOD requirements. We are going to exceed the capability of the shuttle.

Now, the heavy lift booster for the future. There are a lot of unknowns and that is why this is dashed. NASA and DOD have had their first meeting to develop a space-launched strategy for the nineties and after the turn of the century.

[Chart deleted.]

I won't brief this, sir, just to show you once you have the architecture built, you have to time phase your systems acquisition.

There are four programs that, even though this is the year 2000, those programs will not come on board until after the turn of the century.

[Chart deleted.]

Essential actions to take. This one says accomplish reconstitution from on orbit storage because it is very, very difficult in our assessment to make launch facilities survivable and so orbit reconstitution is the way to go.

This talks to satellite control network where you are going to have autonomy to allow you to talk less frequently to spacecraft on orbit.

[Deleted.]

Complementary ELV's for dual access to space. Dual access meaning via shuttle or expendable booster. Dual access is not necessary for all missions because that costs money; so we can't do it for all payloads, but at least for the most critical ones.

The last bullet says we don't know so much today about the manned versus the unmanned question. We have to explore all the technologies in this regard. We are looking at it hard, but to take advantage of what man can do and get the right mix of manned and ummanned systems on orbit.

[Chart deleted.]

This, then, is the summary. The thrust of the architecture. For those things that are done today, we need enhanced survivability. [Deleted.]

Mobile, and we need mobile sites within CONUS if at all possible. We cannot continue to rely on fixed overseas ground stations.

Again, the dashed box on the advanced heavy lift launch vehicle.

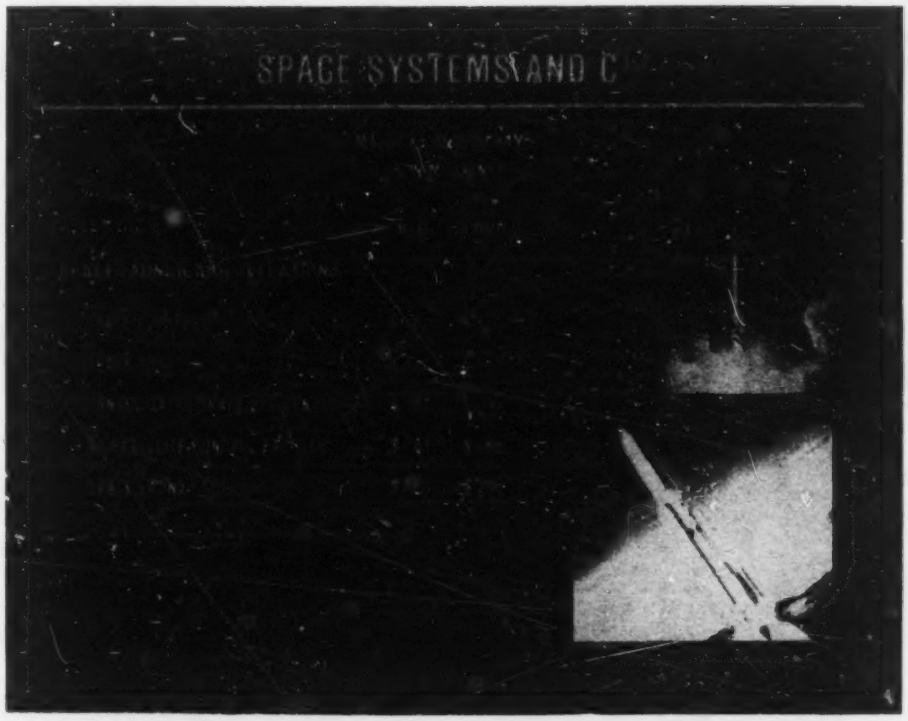
Thank you.

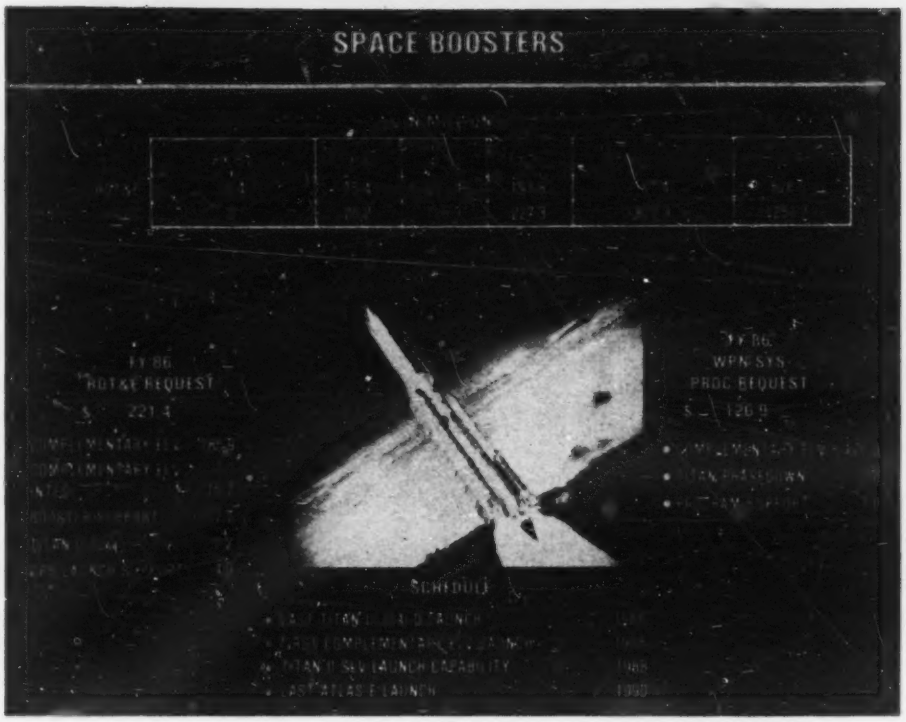
Senator QUAYLE. Is that the end of the briefing?

General KUTYNA. I have about 10 minutes.

Senator QUAYLE. Why don't we insert that for the record?

[Slides provided, follow:]

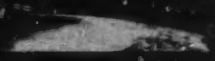

SPACE SYSTEMS AND C


SPACE BOOSTERS
FY 86
BOT&E REQUEST
$ 221.4
FY 86
WPN SYS
PROC REQUEST
$ 126.9
SCHEDULE

SPACE SYSTEMS AND C³

MAJOR FY 86 PROGRAMS
$ IN MILLIONS

	R D	PROC
STRATEGIC COMMAND CONTROL COMMUNICATIONS		
MILSTAR	$ 345	$ [illegible]
MILSTAR (AIR FORCE TERMINALS)	$ 132	$ 34
DEFENSE SATELLITE COMMUNICATIONS SYSTEM	$ 71	$ 198
MIN ESSENTIAL EMERGENCY COMM NET (MEECN)	$ 97	$ 20
NORAD CHEYENNE MOUNTAIN COMPLEX TW/AA SYSTEM	$ 52	$ 14
POST ATTACK COMMAND AND CONTROL SYSTEM	$ 5	$ 72



CONUS OVER-THE-HORIZON BACKSCATTER (OTH-B) RADAR

$ IN MILLIONS

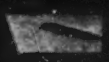
	FY 85 & PRIOR	FY 86		FY 87	TO COMPLETE	TOTAL
ROT&E	[illegible]	[illegible]		364	[illegible]	[illegible]
WPN SYS PROC	967	1484		2745	[illegible]	[illegible]
QUANTITY BUY	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
DELIVERIES	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]

FY 86
ROT&E REQUEST
$ 675

- RADAR EQUIPMENT 520
- ANCR TECH SAT 102
- TEST SUPPORT A/C 53

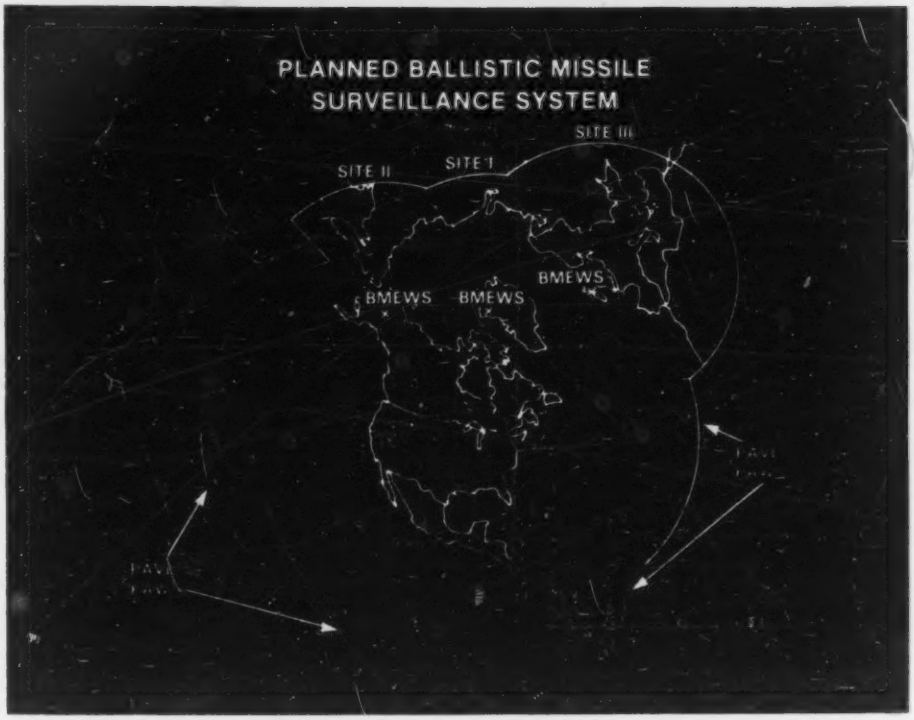
FY 86
WPN SYS
PROC REQUEST
$ 263.8

- OTH 237.0
- RADAR EQUIP 126.3
- SITE PREP 110.7
- INITIAL SPARES AND VEHICLES 26.8



SCHEDULE

- EAST COAST IOC (180 DEGREE COVERAGE)
- WEST COAST IOC
- CENTRAL US SYSTEM IOC
- ALASKAN SYSTEM IOC


PLANNED BALLISTIC MISSILE
SURVEILLANCE SYSTEM
SITE III
SITE II
SITE I
BMEWS
BMEWS
BMEWS

DEFENSE SUPPORT PROGRAM

($ IN MILLIONS)

	FY 84 & PRIOR	FY 85	FY 86	FY 87	TO COMPLETE	TOTAL
RDT&E	1030.2	64.0	79.6	71.6	144.0	1389.4
WPN SYS PROC	2517.2	130.2	270.0	496.5	1414.5	4828.4
QUANTITY-BUY	17	-0-	20	0	3	
DELIVERIES	13	0	-0-	4	5	

FY 86
RDT&E REQUEST
$ 79.6

- MOBILE TERMINALS (MGT) 30.2
- FIXED GROUND STATION 18.8
- LAUNCH INTEGRATION 18.6
- PROGRAM SUPPORT 14.7
- SATELLITE 7.3

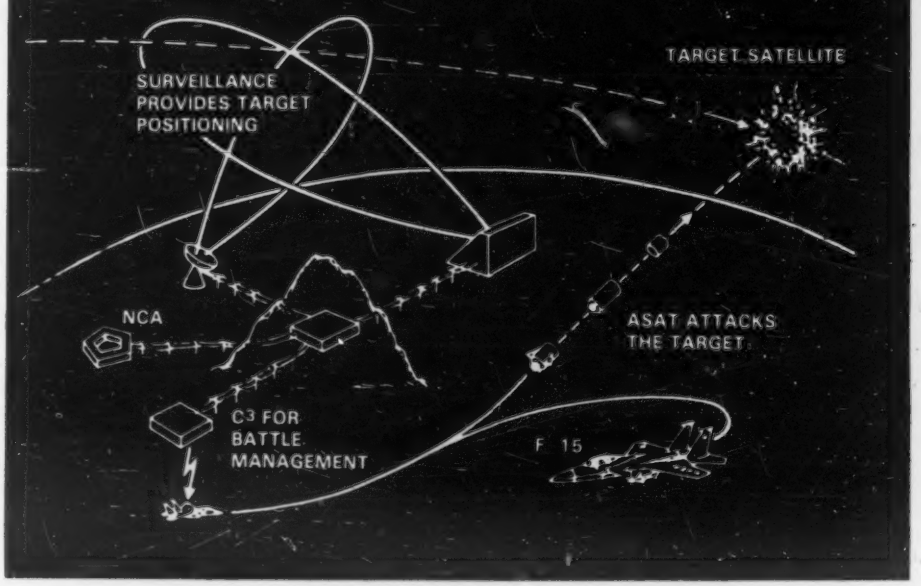
FY 86
WPN SYS
PROC REQUEST
$ 270.0

- SATELLITE
- GROUND STATION EQUIP
- INITIAL SPARES

SCHEDULE

- COMPLETE MGT OPERATIONAL TEST FY 86
- BEGIN SHUTTLE LAUNCHES FY 87

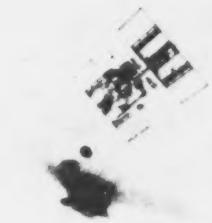
SPACE DEFENSE SYSTEM CONCEPT



SPACE SYSTEMS AND C^3

MAJOR FY 86 PROGRAMS
($ IN MILLIONS)

	R·D	PROC
FORCE ENHANCEMENT		
NAVSTAR GLOBAL POSITIONING SYSTEM	$ 77	$ 254
DEFENSE METEOROLOGICAL SAT PROGRAM	$ 71	$ 68
INTEG OPERATIONAL NUDET DET SYSTEM	$ 21	$ 46

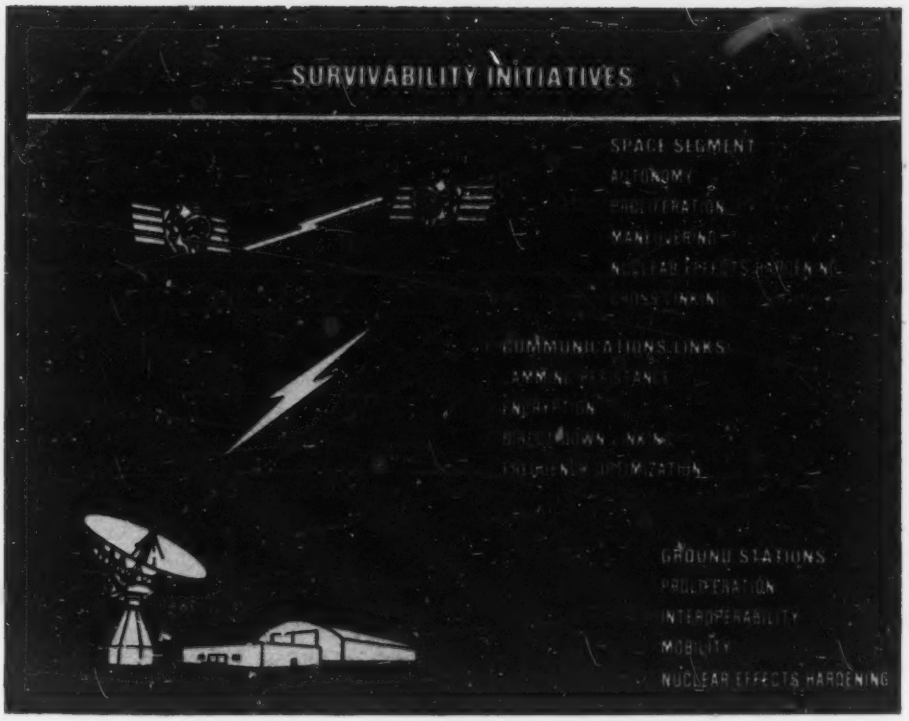


ELECTRONIC WARFARE

Senator QUAYLE. I would like to go back to the eletronic warfare.

What is the greatest threat to satellites now? Is that a long-term threat looking in the future? Is that what you are most concerned about or would you change that assessment?

General KUTYNA. Let me put up a couple charts, if I may, to give you an idea what we are doing about that.



There are three places you can get to the space forces—the space segment, comm links, and the ground stations. So, these are the kind of things we want to provide survivability for the space segment, the comm links, and the ground stations.

[Slide deleted.]

Here is what we are doing in that area. In Milstar you can see the emphasis on the communication links. The kind of things we are putting in there to preclude this jamming threat.

In all of our systems there is a great emphasis to make sure those links remain open.

PRESENT GREATEST THREAT

Senator QUAYLE. What is the greatest threat you have right now?

General BEER. [Deleted.]

That has been the central part of their doctrine, air warfare and land warfare, so we anticipate that is the primary thing we would face today if we were in a conflict.

Senator QUAYLE. What do you think will be the primary thing you will be faced with 10 years from now, the single greatest threat on which you will be spending your time?

General BEER. It will be a whole array of things. If we follow what this architecture calls for from the operational community which the R&D community is putting into effect now, then the

jamming threat is going to be less and less and less because we know how to countermeasure that.

General KUTYNA. We are designing for 10 years ahead. These are the kinds of things that I think in 5 to 10 years will be a threat.

Senator QUAYLE. You think even 10 years from now that jamming and electronic warfare will be the single most important threat?

General KUTYNA. I think the greatest characteristic of Milstar is that it is survivable in a nuclear threat environment and it defeats the jamming threat.

That is the biggest step in designing Milstar, survivability and defeating the jamming threat.

Senator QUAYLE. Are the two similar? If you have an effective jamming capability, you have made that satellite invulnerable, haven't you?

General BEER. Only to that threat, not to the Asat, not to the laser kind, not to the nuclear threat.

Senator QUAYLE. If you look at the whole equation of space and vulnerability of satellites in space, [deleted].

General BEER. Today.

Senator QUAYLE. Today? What about 10 years from now?

General BEER. General Kutyna just described to you how it is being fixed so we will be able to shift.

Senator QUAYLE. If you can fix that, then what will it be?

Looking at the emerging technology that is coming down the line in the Soviet Union——

General BEER. [Deleted.]

Senator QUAYLE. That is what I am trying to get at. [Deleted.]

Does the Navy agree with that?

Admiral RAMSEY. Yes, sir. I would like to approach it a slightly different way.

None of the threats will change except there are going to be maturing technologies.

Senator QUAYLE. When you say none of the threats, what are you putting in that category?

Admiral RAMSEY. The Soviets are still going to attempt to [deleted].

What we have not quite yet addressed and what the study is looking at is what are these maturing technologies in the future, [deleted] but that we are evaluating carefully in a combined effort within the Department of Defense.

Senator QUAYLE. We do not have an exclusive tool, but we are working on it; is that right?

Admiral RAMSEY. Yes, sir.

SPACE MINES

Senator QUAYLE. What are we doing as far as space mines and kinetic energy threats?

Admiral RAMSEY. The Navy is looking to space mine sweepers. [Laughter.]

Senator QUAYLE. How much will that cost?

General BEER. There is some doubt about the credibility of a space mine unless you go to a stationary orbit, geosynchronous

kind of orbit. If a Soviet payload is placed in a higher orbit than a geostationary orbit, we wonder why is the payload in such close proximity?

The space mine is probably not that credible a threat. But you need some delta V. You need to be able to maneuver to help you with the kinetic kill problem.

There are things in this architecture, sir, that I don't have time to get into, but this whole thing is consistent with National and DOD policy, consistent with our national security objectives, things that have been stated in doctrine, and it recognizes the interdependence of both the space segment and the ground segment and survivability is the thrust.

Senator QUAYLE. Is there a possibility that we could make our satellite or have our satellite composed from technology to make them more maneuverable, those kinds of things?

General KUTYNA. Whatever is in the realm of physics, we are looking at.

Senator QUAYLE. What about the [deleted] technology applying to the satellites?

Is that something that looks promising?

Admiral RAMSEY. One of the problems with respect to [deleted] and satellite is that the satellite is way out there. If it is going to perform any useful function, it has to relay data back to earth. When it relays data back to earth, it has to transmit. If it has to transmit, [deleted].

General BEER. [Deleted.]

Senator QUAYLE. Let me go back to one final question.

Admiral RAMSEY. [Deleted.]

Senator QUAYLE. [Deleted.]

Admiral RAMSEY. Yes, sir.

Senator QUAYLE. [Deleted.]

Let me go back to the Asat discussion we had in the open session.

If we had a ban on Asat, what kind of breakout potential or breakout problem would you see on that?

We have described all sorts of potential capabilities, whether it be laser, directed energy or electronic warfare. We know about the coorbital situation.

If you had satellites that had active defensive capability against another satellite or another Asat coming to it, would this defensive capability be banned under an Asat ban? Would it be easier to verify a ban against such Asat testing than to verify a ban against offensive Asats?

Have you thought through the problems of detection?

Could we agree on what type of breakout problems we would have from a technical verification point of view?

General BEER. [Deleted] you don't have to go on [deleted] and give it a higher altitude capability than they have today. You can mate those things so easily onto other vehicles for which no testing is required, just on that one Asat they have today.

But the other, as you start through the lasers and links, things that can also be used in an Asat role, I have to figure out how to verify. That is a challenge that people can't figure out how to handle.

There is too much that can be used in an Asat role, even variations of the one they have today.

Senator QUAYLE. What Asat testing do we have planned for the next couple of years?

General KUTYNA. We had two tests last year, January and November. We shot the vehicle to a point in space to see whether it got near where we wanted it to go. That was successful.

Senator QUAYLE. From the F-15?

General KUTYNA. Yes, and it launched the rocket and it got where it was supposed to. It is a combination of SRAM, aircraft missile, and upper stage.

This fall we fired that vehicle. [Slide deleted.] Here is the SRAM stage and here is another stage. The Asat stage itself is this small vehicle up here. It looks like the size of a [deleted]. It weighs [deleted] pounds.

You get this thing pointed toward the vehicle to intercept. You drop this front end off. [Slide deleted.] This is what the front end looks like, [deleted] size. It starts sensing where the satellite is through its sensor system.

[Deleted.]

The next test we will fly will be this summer, this time against a target in space. So, we have never done that very precise maneuvering to get this thing in front of the target to see if it will hit it.

Senator QUAYLE. You have never done it in space?

General KUTYNA. We have never done it in space.

Senator QUAYLE. We never have done it in space. We are planning on doing it in space?

General KUTYNA. Yes. [Deleted.]

We test fired on the stand and another one blew up [deleted].

Senator QUAYLE. Where is that testing taking place?

General KUTYNA. Edwards.

Senator QUAYLE. It has been fired from the ground?

General KUTYNA. [Deleted.]

Senator QUAYLE. What altitude was it fired from this summer?

General KUTYNA. [Deleted.]

Senator QUAYLE. You are going to try to hit something?

General KUTYNA. Try to hit a target in space.

Senator QUAYLE. Picking up a star was the last one. It didn't hit it. [Laughter.]

I thank you for the information. It is very valuable. Good luck.

[Questions with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR JOHN WARNER

JOINT NASA/DOD STUDY ON EXPENDABLE LAUNCH VEHICLES

Senator WARNER. General Kutyna, can you summarize for the Committee the findings of the joint NASA/DOD study with regard to expendable launch vehicles?

General KUTYNA. The report on Complementary Expendable Launch Vehicles (CELVs) was prepared in response to a request in the Appropriations Committee Conference Report for Fiscal Year 1985. The objectives were to review expendable launch vehicle requirements into the 1990s, assess Shuttle derived technology and analyze cost implications of alternatives. This joint DOD, NASA, and OMB report concluded that (1) there is no payload requirement greater than 10,000 lbs to geostationary earth orbit (the Shuttle and CELV capability) during this time period; (2) although the STS is a highly reliable system and the DoD remains fully committed to it, total reliance on a single system for access to space represents an unacceptable

national security risk; (3) proposed solutions offer significant growth potential if later needed; and (4) the DoD CELV program satisfies the near term requirements and provides the least costly, most flexible, and most robust approach to future space launch needs of the United States. In recommending a course of action, the report concludes that the Air Force should provide a CELV to meet national security needs in 1988, and work jointly with NASA on technology and trade studies for future launch requirements.

IOC FOR THE ELV PROGRAM

Senator WARNER. General Kutyna, what is the significance of the 1988 IOC for the ELV program, and what would be the impact of significant reductions or deferral of the fiscal year 1986 request?

General KUTYNA. The 1988 IOC for the CELV is predicated on well defined and validated DOD priority launch requirements. The October 1988 date is based on a firm launch requirement for the Joint Chiefs of Staff [deleted].

Any delay in our fiscal year 1985 reprogramming request or significant fiscal year 1986 CELV reduction or deferral would seriously jeopardize the entire CELV program and affect future launch schedules for critical DOD and national satellite programs.

In response to Presidential direction, the Department of Defense is pursuing a launch vehicle option which incorporates hardware, facilities, and industrial base independent of the Space Shuttle. This provides a true complementary system.

The ELV industrial base has already begun to erode and production of expendable launch vehicles is now being phased out with the last vehicles in final assembly. Any significant delay would close down ELV production capability. Once production lines are closed and the sub-tier contractors disappear, a restart will be extremely costly and production time will be considerably longer. With an ongoing production base, normal lead time for the manufacture of an expendable booster is approximately 42 months; however, starting a launch vehicle program without an existing launch vehicle industrial base would require 7 to 10 years lead time. For a less drastic reduction which does not shut down the industry, but delays program start into the fall of 1985, approximately 50% of the critical sub-contractors will be shut down. The reestablishment and requalification of this sub-contractor base will slip the first launch capability to approximately mid-1990—and significantly increase cost.

Any launch delay impacts the ability of critical DOD programs to launch on CELV. A funding reduction would not only impact the [deleted] but would cause scheduling and funding problems for Milstar [deleted] and a [deleted] due to missed block change launch vehicle configuration design.

We believe this October 1988 launch date to be very important, and thus have strongly incentivized the contractor for early launch vehicle delivery, and will substantially penalize late delivery.

ASAT TEST

Senator WARNER. What is the current status of the development program relative to the ability to support a test against an object in space? When will the first such test take place?

General KUTYNA. The Asat test program consists of two major efforts at this time: qualification testing of the miniature vehicle/dispenser, which is being done at ground facilities, and the flight test program. We have successfully completed six parts of the eight-part qualification testing needed to support our first intercept flight. During the seventh part of this testing, on two different occasions, one of the 64 solid propellant motors in the maneuvering propulsion assembly (MPA) of the miniature vehicle has exploded. The contractors, the program office, and an independent team of experts are investigating the cause of this failure and will recommend necessary changes to the motors. The AF has completed over thirty captive carry flight tests. These tests have verified that the F-15 can operate safely with the Asat missile in a variety of operational conditions; that the surveillance system, command and control, and weapon system operate together properly; and that live fire test missiles are ready for flight. We have completed two live fire tests with the Asat missile: the point-in-space flight in January 1984 and the infrared probe test in November 1984. The point-in-space test was completely successful. The infrared probe test was a partial success because cryogenic lines failed to retract properly from the miniature vehicle. However, sufficient data were obtained to allow our proceeding to the first intercept test. The cause of the cryogenic lines failure to retract has been determined and the fixes are being made to the test missiles. The first intercept test against an instrumented test vehicle is scheduled for [deleted].

ASAT PRODUCTION FUNDS

Senator WARNER. General Kutyna, in view of the development problems with the Asat, is the program ready to spend the production funds that were approved last year, and that are requested in the fiscal 1986 request?

General KUTYNA. An Air Force System Acquisition Review Council is scheduled to meet in August 1985 to determine whether the Asat system is ready for production. All qualification tests on the Asat missile will be completed by that date. We will have completed about forty captive carry flight tests with the Asat missile and three (perhaps four) live fire tests. The live fire tests include the point in space test, the infrared probe test and the one (perhaps two) intercept test. There is concurrency between the development and production programs; however, we are trying to counter a long-standing imbalance between Soviet and U.S. capabilities in the area of space defense. We are therefore trying to deploy the system as rapidly, yet prudently, as possible.

FISCAL YEAR 1986 REQUEST ASSOCIATED WITH BOOSTING PAYLOADS

Senator WARNER. General Kutyna, could you draw a direct relationship between the procurements in the fiscal year 1986 request associated with boosting payloads into orbit, and the dates on which those payloads are required in orbit?

General KUTYNA. Although it is very complex due to the large numbers of satellites and launch vehicles, there is a direct relationship between the fiscal year 1986 satellite procurements, required need dates, and launch dates. The FY 1986 order quantities, delivery dates, launch dates, and required capability dates, for each individual space program are detailed below.

Air Force Satellite Communication System (AFSATCOM)—In fiscal year 1986 we are funding the procurement of one AFSATCOM transponder to be flown on another host satellite. The transponder will be available for launch in [deleted] to sustain strategic connectivity until Milstar is operational. The actual launch date is driven by the host satellite. This transponder is required to replenish the existing AFSATCOM transponder constellation. The launch availability date is predicted by a mathematical reliability/availability model.

Centaur Upper Stage.—In fiscal year 1986 we will be continuing the incremental funding of the first Research, Development, Test and Evaluation (RDT&E) Centaur and starting a second RDT&E Centaur. These two upper stages are to be delivered in fiscal year 1987 and fiscal year 1988 respectively. Both will be used to launch Milstar RDT&E satellites from the Space Shuttle in [deleted]. These launches are needed to provide for Milstar's satellite constellation Full Operational Capability date of [deleted]. Centaur Upper Stages are programmed in the Space Launch Support program line.

Defense Meteorological Satellite Program (DMSP).—In fiscal year 1986 we are purchasing two moisture sounders, one each for DMSP Satellite 13 (S–13) and DMSP Satellite 14 (S–14). In addition we are purchasing one microwave imager for DMSP Satellite 15 (S–15). The two moisture sounders will be delivered fiscal year 1988 and the microwave imager in fiscal year 1989. S–13 and S–14 are planned for launch from Atlas launch vehicles in fiscal year 1989. S–15 will be launched from a Titan II Space Launch Vehicle in fiscal year 1990. These launches are required to replenish the existing DMSP satellite constellation and the launch dates are based on anticipated failure data from a satellite reliability/availability model.

Defense Satellite Communications System (DSCS).—In fiscal year 1986 we are fully funding two more of the seven satellites purchased on a multiyear contract. Both will be delivered in fiscal year 1989. One will be paired with a previously deliverd DSCS satellite and launched with an Inertial Upper Stage from the Space Shuttle in [deleted]. The other satellite will be paired with a DSCS satellite delivered in the future under the same multiyear contract and also launched with an IUS from the Shuttle in [deleted]. DSCS satellites are launched with a replenishment/store-on-orbit philosophy to sustain continuous, high priority Defense Communications Agency (DCA) requirements. The first satellite is required to be on orbit by DCA in [deleted]. The second is required by DCA in early [deleted]. The DSCS multiyear contract delivers satellites slightly faster than what is required in terms of orbital force structure. This is traded against the $140 million savings achieved by producing satellites at the slightly higher, but more optimum rate. The satellites are launched [deleted] and stored on orbit, which is significantly cheaper than ground storage and far more attractive from an operational availability viewpoint. This accounts for the launch of the second fiscal year 1986 procured DSCS satellite approximately [deleted] prior to the actual DCA requirement.

Defense Support Program (DSP).—In fiscal year 1986 we are buying the last of four DSP laser crosslinks. This unit will be delivered in fiscal year 1991 and installed on a DSP satellite for launch [deleted] by a Complementary Expendable Launch Vehicle. DSP launches are done on a replenishment basis as dictated by the Joint Chiefs of Staff (JCS) requirements. The JCS anticipates that a DSP launch will be required in this time period based on the health of the current DSP constellation.

Navstar Global Positioning System (GPS) and the Integrated Operational Nuclear Detonation (NUDET) Detection System (IONDS).—In fiscal year 1986 the Air Force continues the 28 satellite mutliyear procurement by fully funding nine more satellites which support both the GPS and IONDS missions. Two of these satellites will be delivered in fiscal year 1987. Seven more will be delivered in fiscal year 1988. These satellites will be launched in the same fiscal year as they are delivered from the Space Shuttle with PAM-D II Upper Stages. They are required to be launched at that time to build up the initial GPS and IONDS 18 satellite constellation to meet a Calendar Year 1988 Full Operational Capability date.

Inertial Upper Stage (IUS).—In fiscal year 1986 we are fully funding three IUS's started with fiscal year 1985 Economic Order Quantity Advance Procurement funds. One will be delivered in fiscal year 1988 and the other two will be delivered in fiscal year 1989. These vehicles will be used to launch DSP and DSCS satellites in [deleted] and [deleted]. IUS's are funded in the Space Launch Support program line.

[Deleted.]

Payload Assist Module—Delta Class II (PAM-DII).—In fiscal year 1986 the Air Force is continuing the multiyear procurement of 28 PAM-DII's. Four will be delivered in fiscal year 1987 and the other five will be delivered in fiscal year 1988. Two of these will be used to launch Navstar GPS satellites (which include the IONDS mission) from the Space Shuttle in fiscal year 1987. The other seven will also be used for the same in fiscal year 1988. The launches are required in this time period to meet the GPS and IONDS Calendar Year 1988 Full Operationall Capability of 18 satellites on orbit.

Space Boosters (Complementary Expendable Launch Vehicle (CELV)).—In fiscal year 1986 the Air Force is incrementally funding the production of seven CELVs. Three additional CELVs are being funded by a classified user. The total procurement will be for a quantity of 10 CELVs. CELVs are planned to be launched at a rate of two per year as a complement to the Space Shuttle beginning in October 1988. The schedule driver for the CELV October 1988 initial launch capability is the launch of a [deleted].

SUCCESSFUL TESTS

Senator WARNER. General Beer, with regard to Asat testing, how would you define a successful test against an object in space, and how many such "successful" tests would be required in your judgment before the Space Command would consider the Asat capability to be operational?

General BEER. At first glance one would think a successful Asat test against an object in space to be simply a physical intercept of the intended target. However, as you know, our test requirements are based on a number of major and minor objectives. I would define a successful test as one which met the majority of its test objectives. The Air Force has planned for a total of ten Asat intercept tests against the ITV in a combined Development Test & Evaluation/Initial Operational Test and Evaluation program. The test program is structured so that the flight test mission profiles are increasingly difficult, thereby more closely emulating operational conditions. The operating commands, Space Command and Tactical Air Command, are investigating the need for a Follow-on Operational Test and Evaluation (FOT&E) program. No decision has been made on the scope of FOT&E.

SHUTTLE OPERATIONS AND PLANNING COMPLEX

Senator WARNER. General Beer, what is the current status of the shuttle operations and planning complex?

General BEER. The Shuttle Operations and Planning Complex (SOPC) will complete a competitive Phase I design in August 1985. The competing contractors will provide their final design proposals by November 1985 for Phase II acquisition. The contract award is scheduled for April 1986. The initial operational capability for mission/flight planning is scheduled for 1989.

Senator WARNER. General Beer, what would be the operational implications of a further delay in the availability of this complex?

General BEER. The operational impacts of further delay to the SOPC include:

1. DOD's primary access to space would continue to be at risk due to dependence solely on the single Shuttle control node at Johnson Spaceflight Center (JSC).
2. Additional funds would be required to expand NASA's facilities to support increased DOD requirements.
3. The DOD would more frequently exercise its option to preempt non-DOD Shuttle flights as DOD flight frequency increased.
4. Non-DOD Shuttle missions would experience substantial launch delays. Recent studies show these delays are projected to start as early as 1988 due to JSC saturation.
5. The risk of security compromise of classified space programs would continue due to the security limitations of JSC.

NAVY SPACE SURVEILLANCE ACTIVITY

Senator WARNER. Commodore Truly, can you describe for the subcommittee how the Navy's space surveillance activity supports the overall mission of space surveillance.

Commodore TRULY. The Navy's space surveillance activity, Naval Space Surveillance System (NAVSPASUR) at Dahlgren, Virginia, supports the nations's overall space surveillance efforts by providing unalerted space object detections which are over 30 degrees inclination. This space object detection is fed to the North American Aerospace Defense Command's (NORAD) Space Surveillance Center for evaluation and inclusion in the master space object catalogue. NAVSPASUR maintains a independent space object catalogue which can maintain 75 per cent of all the space objects detections alone. NAVSPASUR routinely receives observations from other NORAD sensors to complete a duplicate space object catalogue at Dahlgren.

On October 1, 1984, NAVSPASUR became the Alternate NORAD Space Surveillance Center (ANSCC) responsible for tasking space sensors and space catalogue maintenance as the back-up to the Cheyenne Mountain Complex.

NAVSPASUR has been a major portion of the nation's space surveillance effort since the early 1960's and continues to be an integral part of a coordinated Navy-Air Force effort.

An additional mission of NAVSPASUR is to use the space catalogue to provide [deleted]. This mission provides tactical support to fleet units world wide.

Senator QUAYLE. Gentlemen, the committee is adjourned.

[Whereupon, at 12 noon, the subcommittee adjourned, subject to the call of the Chair.]

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